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Advertisement Index, see page xl.

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ELECTRICAL REVIEW.

VOL. XC. APRIL 7, 1922. No. 2,315.

ELECTRICAL REVIEW.

Vol. XC.] CONTENTS: April 7th, 1922. [No. 2,315.

	Page
The Chinese Market through Native Students	469
The Lock-out	470
Electricity in Agriculture	471
The Electricity Supply Bill	471
Illuminated Electric Signs (*illus.*)	472
The Australian Market	475
Low-grade Coals for Electric Power Generation	477
Legal...	478
Parliamentary Notes	479
Business Notes	480
Notes...	486
City Notes	490
Stocks and Shares	493
Market Quotations	494
Try Another Way	495
Electro-farming, by R. Borlase Matthews	496
The Daysohms "Utility" Arc Welder (*illus.*)	498
The British Electrical and Allied Manufacturers' Association (Inc.)	499
Correspondence—	
The Uninsulated Return	501
The Cost of Living in India...	501
What's in a Name	501
Iron-nickel Accumulators	501
Commercial Electrolytic Iron	501
Electrical Machinery at the Glasgow Exhibition	501
New Electrical Devices, Fittings, and Plant (*illus.*)	502
Single and Three-phase Commutator Motors	503
New Patents	504
Published Specifications	504
Contractors' Column ... ... Advertisement page xxviii	

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THE CHINESE MARKET THROUGH NATIVE STUDENTS.

As we have repeatedly stated here, the enormous area and population covered by China afford or will afford an almost inexhaustible scope for the activity and enterprise of financiers and manufacturers. China was already a happy, or unhappy, hunting ground for concession seekers a couple of decades ago in the matter of railways, ports, &c.; yet her rail transport facilities are still in a most backward stage of development. With her great natural resources in minerals, China is awakening to the fact that it is necessary further to develop her own industries so as to be able to supply at least a larger portion of the inland requirements in manufactures of various kinds. Some steps have already been taken in these directions, and periodical reports reaching us and quoted in our "Business Notices" under "Chinese Notes" indicate the electrical projects selected by us from a large number of schemes that are being proceeded with, but these are mere bagatelles as compared with what may be expected in future years.

The opening up of new coal and iron ore mines, the erection of further blast furnaces and steel plants and rolling mills, the extension of mechanical engineering works, the establishment of electrical manufacturing works, the promotion of electricity supply for lighting and power purposes, the expansion of the textile industries, all these and many other branches, including the great problems in connection with civil engineering, will place a most acceptable demand upon the engineering resources of those nations which have had the prevision to make preparations for participation in the industrial equipment and expansion of the great country in the Far East.

When internal conditions in China have become of a more settled character and it is possible for a stable Government to exercise control over the country, the financial position there will gradually begin to improve, foreign capital will again flow into the country, and the time will have arrived when the rich Chinese merchants and industrialists will be able to proceed more energetically with the promotion of industrial establishments and other works. But we shall be unwise if we ignore the fact that in the meantime a lot of preparatory work will have to be carried out by those nations which intend to participate in the future development of the country when the stage of stability has been reached.

As in the case of Japan, so in that of China, does the desire exist for native ownership or control to be exercised over the industries which are or which will be brought into existence. Most of the rich Chinese merchants and industrialists were themselves trained in other countries, and the value of their training has so impressed them that they have rendered assistance in the sending of young Chinese to other countries for industrial training in order that they might be able to qualify as managers or assistants in the industries which

have been built up or are in contemplation. But there is a limit even to the financial aid which private Chinese interests are prepared or are able to go to in the dispatch of students to other lands; and it is here that the opportunity arises for a big industrial nation to come in to assist China for mutual benefit, an opportunity not only of receiving Chinese students in manufacturing works in an industrial country, but also of rendering valuable aid in the training of Chinese in technical schools in China herself.

It seems advisable in this connection again to emphasise the fact that the industrial or engineering student of to-day is the works or factory manager of the future, and that his particular training naturally gives him special interest in the use of the plant and machinery made by the foreign country where he received his industrial education or in the equipment with which he had become familiar in a technical school in China. The former consideration was perhaps one of the reasons why the Government of the United States decided to return America's share in the Boxer indemnity, so as to permit of the maintenance of Chinese students in industrial training in the United States. In this connection the *British Chamber of Commerce Journal*, of Shanghai, discussing the question of technical scholarships for Chinese, expresses the hope that the institution and grant of such scholarships will be brought within the scope of the Associated British Chambers of Commerce in China at no distant date, and states that this would be rendered possible if the British Government were also to remit the Boxer indemnity. In this event the Associated Chambers consider that the experience of the Government of India in the matter of the grant of scholarships to Indians during the past twenty years, permitting them to come to England for training, would be an invaluable guide to the Chambers in proceeding with the matter with regard to China.

The prevision of the United States Government in the relinquishment of the Boxer indemnity has been justified by events. A constant stream of Chinese students reaches the United States every year, and over two thousand are studying there at present. In France a similar number is to be found as a result (1) of the formation in Peking of the Chinese-French Educational Community, and (2) of the facilities afforded by the French Government for securing the introduction of the students into French educational institutions and French industrial works. On the other hand, only one tenth of this number is known to be either in England or in Germany. Thus, there should be plenty of scope for the proposal of the Associated Chambers of Commerce in China in the direction of scholarships for approved Chinese students who would be sent for training to Great Britain.

If, however, it is impossible for the time being for various reasons to increase the number of Chinese students in England, the best alternative is to assist in the training of them in their own country; and a fresh occasion is now available for British firms to render aid in this direction in their own common interest for the furtherance of trade with China. According to the *Bulletin* of the Federation of British Industries, the Education Committee of the Federation recently had under consideration the question of the Chunghua Vocational School, which was established in the neighbourhood of Shanghai in 1918, through the efforts of the National Association of Vocational Education in China. The committee decided to recommend the school to the attention of members as a project worthy of consideration both on account of the useful work the school is carrying on and of the excellent opportunity it affords for acquainting the Chinese generally with British methods and manufacturers. Designed to provide vocational education for the Chinese student at home, the *Bulletin* states that with the exception of that at the Hong Kong University, it is the only engineering vocational school in China. This statement naturally implies that the German combined language and engineering school in China disappeared during the war and has not been re-established.

The Chunghua school at present comprises an engineering shop, wood-working, button-baking, and enamelling shops, physics and chemical laboratories, an electroplating shop, &c., but in view of the wide-spread demand for admission, it is desired to extend the curriculum so as to include electrical and civil engineering, industrial chemistry, textile manufactures and dyeing, toy-making, printing, and other courses in applied science. The tuition is free in all cases, although students are required to pay their own boarding fees, and the necessary funds are largely provided by the sale of the goods manufactured in the school workshops. At present the institution is practically an English school, but, according to a member of the Federation who recently visited it, the Americans are taking a keen interest in the school and are anxious to obtain control over it. The plant is said to be getting somewhat out-of-date, and the school is in great need of new equipment.

The question now is whether the school is to maintain its English character or become Americanised. We should say that it is in the greatest interest of British firms to preserve the English nature of the school and not let any competitors derive the ultimate advantages resulting from the English training at the school or receive the fruits of these labours in the future. For these and other reasons we heartily support the recommendation of the Education Committee of the F.B.I. that British firms should come forward once again (as they did at Hong Kong in response to our appeal) and supply, or contribute towards the purchase of plant and equipment required by the school.

We have discussed this matter again and again in relation to particular markets of the world. Hongkong University's needs were met, there has recently been an appeal in our pages on behalf of Cape Town, and now we have the present requirements of China put prominently before us. We have long felt that British manufacturers would find it well worth their while to consider the whole of the important future engineering markets of the world and elaborate a world policy and organisation to deal enterprisingly with their trade relationships to foreign students—the leading engineer-purchasers or advisers of to-morrow. We are therefore glad to note that in the B.E.A.M.A. the subject of admitting oversea students into its members' works has been carefully investigated, and a publication is being prepared setting out the facilities that are in existence. The number of oversea students in the works in question is extremely small, namely, only 92, and they come from all parts of the world, but chiefly from Australia, Egypt, India, and South Africa.

THE LOCK-OUT.

Last week there seemed, at the time of writing our leading article, to be some reason for optimism; at the time of writing this there is a division among the unions which may be the beginning of the end.

Notices were posted in engineering works connected with the Employers' Federation on Wednesday last week, to members of Unions other than the A.E.U., and the notices were to become effective within the week. It soon became obvious that there was disagreement between the A.E.U. and the other unions regarding a basis for reopening negotiations. On Saturday night there was a conference at the Ministry of Labour to consider a new document submitted by the employers on the previous day. On Tuesday the negotiating committee met the Prime Minister, by invitation, and later it was announced that the three Federations of Unions, other than the A.E.U., through their representatives, in-

formed the Prime Minister that they were prepared to accept the employers' revised memorandum as the basis of negotiations if the employers would postpone the lock-out notices which were to terminate on the Wednesday as stated above. Whether the employers will agree to this is unknown to us at the moment. The Prime Minister tried to bring pressure to bear upon the A.E.U., but the latter adhered to their previous decision that as the principles embodied in the memorandum of April 1st were the same as those in the memorandum of November, 1921, which their members had rejected by ballot, the basis was not one on which they could resume negotiations. The Labour house is therefore divided against itself, and it remains to be seen how long it can stand.

From a close study of public opinion, as reflected in the newspapers representing various parts of the country, we are of the opinion that there is no feeling in favour of this lock-out. There is, and we think it is justified, a due appreciation of the difficulties of engineering employers with regard to the shop steward question and the much-talked-of managerial functions. But the existence of some just cause for complaint, and its general acceptance as correct, does not guarantee wise, tactful, or considerate handling of the issue. There is a widespread feeling of impatience and annoyance at this unexpected blow, coming as it does just at the moment when trade appeared to be taking a turn for the better. The employers being the party responsible for the lock-out, and for the repeated breaking-off of negotiations on one pretext or another, it is natural that doubt shall arise as to what lies behind it all. The overtime question can be dismissed; it is obviously the merest occasion for the dispute, and not its cause. As we said last week, no sane employer wants to pay time-and-a-half for less efficient work. The managerial function question is more plausible, but in itself it is not sufficient for what must quite candidly be described as the arbitrary attitude that has been adopted by the employers throughout the whole course of the trouble. The extension of the dispute and the bitterness engendered has led to unreasonableness and displays of temper on the part of the hot-headed section of the workers. *The Communist* urges them to "Fight, damn it, fight!" The Electrical Trades Union suggests butting in with a strike and an attempt to shut down the power stations. No sympathy will be extended to wild nonsense of this kind, but we have learned to take it from whence it comes. We expect better things from the employers; and after we have heard so much during the years of the war about co-partnership, team work, bearing one another's burdens, and what not, it is disheartening to find an absolutely unyielding frame of mind, refusing to discuss terms, but merely presenting them for acceptance.

The Unions still press for the setting-up of an Industrial Court. What the country wants is the facts, and these can be ascertained by an Industrial Court better than by any other method.

Already, as news reports show, some employers are starting to economise with their office staffs. We hinted at the possibility of this early in the dispute. If the technical workers had a really powerful union of their own, some useful opposition to such a move might be organised; but as they have made their bed, so must they lie. If trained technical men will not find the money required for the purpose, if they neglect, as they have neglected, the opportunity of creating and maintaining the needful organisation, they have only themselves to thank when they find themselves out in the cold.

It is to be hoped that the employers will feel such confidence in the rectitude of their side of the case that they will join with the Unions in asking for an inquiry. If not, it is the plain duty of the Government, in the interests of truth and of the nation at large to take the necessary steps to bring the Industrial Court into being. If its findings are unacceptable they cannot be enforced, though there would naturally be strong moral pressure against the side refusing to accept them; but even in this lamentable eventuality the facts, for instance, about managerial functions, their exercise and the amount of interference with them that exists, would be available for the information of the public.

Electricity in Agriculture.

The Institution of Electrical Engineers on Thursday last week enjoyed an exceptional treat when Mr. R. Borlase Matthews described the uses to which he has applied electricity on his 600-acre farm. In addition to ordinary lantern slides, he made excellent use of the kinematograph to illustrate farming operations, not only on his own but also on Continental farms, thus vividly impressing on the minds of the audience the nature of the problems with which the farmer is confronted and the methods which have been adopted to solve them. Incidentally, he also indicated by this means the rapid progress which is being made in the utilisation of water-power in a German province for the generation of electricity; and his demonstration of mechanical accountancy was most effective.

In the course of the discussion (which was to be resumed yesterday, owing to the large number of members who desired to take part in it), Mr. Bernard Jenkin, who stated that he had just completed seven years' "apprenticeship" to farming (how many more electrical engineers are going back to the land?), laid stress on the enormous proportion of transport and haulage met with in farming operations, and drew the conclusion that electricity was eminently unfitted to compete with the internal-combustion-engined tractor. Although Mr. Matthews uses a battery vehicle on his farm, it cannot be denied that Mr. Jenkin's case is a strong one, under existing conditions; but how long will this obtain?

Battery traction has been tried for ploughing and other haulage operations on farms, but is handicapped by the excessive weight of the vehicle, which makes it most unsuitable for use except on metalled roads, while the occasional efforts involved in ploughing call for excessive rates of discharge from the battery, to the detriment of the plates. But when a battery tractor weighing only half or one third as much as the present vehicle is available, capable also of standing up to heavy discharges with equanimity, the situation will be fundamentally changed, and the uses of electricity on the farm will be immensely extended.

The Electricity Supply Bill.

The opposition to the Bill in the House of Lords on Tuesday last assumed a ridiculous aspect. It was gravely alleged that the Bill was too technical and too complicated to be dealt with by the House, and should be referred to a Select Committee, although that House did not hesitate to deal drastically with the far more complicated and technical Bill of 1919 in a couple of days. Scruples regarding the laying of burdens on the ratepayers were advanced by men who in the same breath demanded a procedure involving the expenditure of perhaps £20,000, a delay of many months, and the probable crippling of the work of the Electricity Commissioners for another year at least.

The whole subject has already been thrashed out *ad nauseam*, and the opposition seems to be merely that of interested parties who wish to block the Bill at any cost. However, nine clauses were passed on Tuesday, embodying the bulk of the provisions of importance.

D

ILLUMINATED ELECTRIC SIGNS.

The remarkable displays of animated electric signs which for some time past have enlivened Piccadilly Circus and other busy traffic centres in London have attracted much attention, due not only to the skill with which they have been designed, but also to the novelty and ingenuity of the movements which they simulate. Some particulars regarding the methods by which these striking effects are produced may be of interest to our readers. The field is one in which electrical methods are not merely supreme, but absolutely without a rival, for by no other means can results be obtained which can for a moment be compared with them.

The use of electric signs is, of course, as old as the incandescent lamp, but it should not be supposed that the subject has been fully developed—far from it. Progress in this country was held back during the years

from condensing to "pass out" would mean a large drop in power it would pay the country to instal more plant and sell the heat. Transmission losses only amounted to about .04 lb. of steam per square foot of surface per hour.

Mr. H. C. Lamb put forward some illustrations to show that it was impossible to balance electrical and heating loads, even in such a favourable district as Manchester.

Mr. Nelson Haden wished to see co-operation between gas and electricity works and other public services, which would lead to a more satisfactory position as regarded heating. He mentioned that 336 towns in the United States had central heating stations; most of them were supplied with high-pressure steam, and the stations were under the control of and worked in conjunction with the electrical stations.

Mr. A. B. Mallinson said that not only the load factor, but also the pressure factor had to be considered. The pressure could be standardised for supplying dwellings, but manu-

societies and bodies of men to be drawn. From his knowledge of both sides of the dispute he believed that the trouble arose very largely from a misunderstanding of the true facts of the case. There was no doubt that a large number of men believed that a deliberate attempt was being made to injure the trade unions, but he could say that such was not the case. He hoped that suspicion would be soon dispelled, and that both sides would soon come together, as ultimately they would have to do.

Dr. H. F. Parshall, in his reply, said it was a pleasure to come to Lancashire because the county got hold of the engineer's end of things. In the south they had engineering adulterated. The engineering intelligence of Lancashire was of the highest order.

After the speeches there was an interval for an informal talk amongst the members, after which a musical programme was rendered.

The lamps and holders are of course most important features in the construction. The former are made of a particular standard size and shape, and are provided

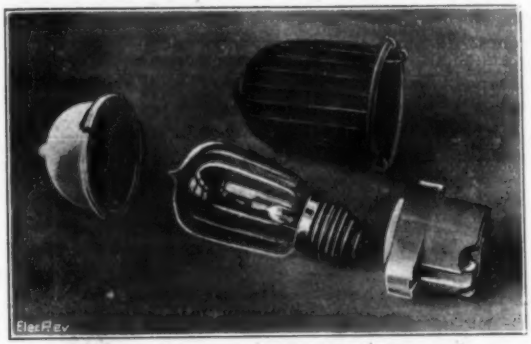

Fig. 5.—Lamp, Holder, Cap, and Hood.

with Edison screw bases, the bayonet holder being entirely unsuitable for this purpose, owing to the narrow separation of the parts exposed to a pressure of 200 or

of colour attachment is the cap, which is hemispherical in form and fits snugly over the pip end of the lamp only. Its use is confined mainly to displays having coloured backgrounds, such as the familiar flaming torches or the vivid green plumage of the Strand parrot. When an opal cap is used with the standard white channel letter a very noticeable improvement in the effect is obtained. The series of bright light spots, generally accepted as inherent to all electric signs, disappears almost entirely, and the channel is instead filled with a soft white light of practically uniform value, giving very clear definition over a wide angle of view, while permitting wider lamp spacing than is otherwise necessary. The difference in the effects obtained with the hood and the cap respectively is well seen in fig. 4, where the lamps in the word "Glaxo" are fitted with hoods, whilst the lamps in the other words are fitted with opal caps.

Turning now to the method of imparting the appearance of movement to the signs, we illustrate in figs. 6 and 8 two of the controllers used for this purpose, the former being in the company's workshop and the latter, photographed *in situ*, being the apparatus which actuates the picture of a revolving wheel and other features of the Pirelli sign shown in fig. 4. The controller or flasher, as it is more commonly termed, consists of one

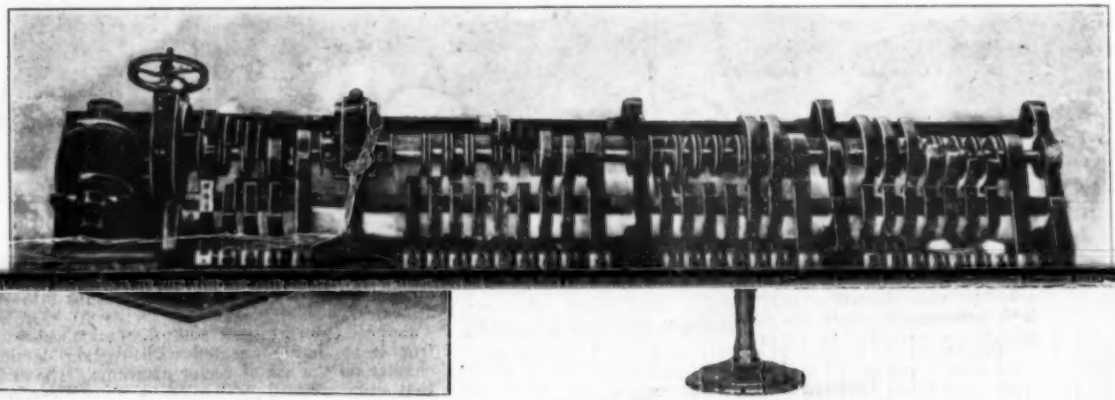

Fig. 4.—A. B.T.H. Table Standard.

Fig. 2.—A Large Hand-operated Cable Winch.

manufactured by Messrs. Henley's, and each length is 1,014 ft., and weighs 7¼ tons. It is a .75 sq. in., 3-core cable, [illegible] insulated, armoured with special high tensile steel wire, and jute braided, the overall diameter being 3⅜ in.

It was specified that the winches should be operated by hand, and it was therefore necessary to provide gearing giving a reduction of 524 to 1. This reduction is obtained by means

dards carried out in various sizes, designs, and finishes. One of these is illustrated in fig. 4. This is 20¼ in. in height with an amber-glass shade 16¼ in. in diameter. It is fitted with two pull-chain switch lampholders and a flexible cord with a combined plug and lampholder adapter. This standard is supplied in one of three finishes, antique bronze, Florentine relief, or dark French brown.

THE FARADAY SOCIETY.

Passivity and Overpotential.

Mr. Ulick R. Evans read a very suggestive paper at the February meeting of the Faraday Society, in which he put forward a new conception of the "protective oxide-film" on metals, which is so often called upon to explain such surface effects on metals as passivity and over-potential. Passivity, it will be remembered, is an inactive state that can be induced in metals such as iron, chromium and others, in which they fail to react with acids or other electrolytic reagents which normally attack them. Over-potential is the depression of the P.D. at a cathodic surface below the equilibrium P.D. before hydrogen is evolved in bubbles.

The usual "oxide-film," in the literal sense, which is called upon to explain passivity or the resistance of highly-oxidisable metals, such as aluminium, to corrosion, is unsatisfactory in that it cannot be detected by ordinary means; in fact the less conspicuous the protective corrosion product the more it seems to protect. Moreover, an oxide-film which is quite efficient in preventing corrosion by a sulphate solution, breaks down entirely in the presence of chlorides. To remove these and similar difficulties Mr. Evans introduces the factor of the relative interfacial tendency of the three substances involved (metal, corroding reagent and corrosion product). The values of these three tensions will determine whether the corrosion product will cling to and protect the metal, or whether it will enter the body of the liquid phase or corroding substance and so fail to protect the metal. An iron anode surrounded by a nitrate solution, free from chlorides, undergoes no visible change when current passes, but becomes passive; a similar anode in a solution containing chloride develops a most visible precipitate of hydroxide, which completely fails to protect the anode. Apparently the protective film in the first case is the compact clinging variety, but in the second case the chloride acts as a partial peptising agent, preventing the oxide from being compact and protective, and pulling it away from the surface. Generally speaking, salts which have a peptising action upon metallic hydroxides may be expected to cause activation, while those which have a flocculating action may be expected to favour passivity.

As to the nature of the oxide-film, this is not to be regarded as a very thin film of the solid oxide. It must be looked upon as a layer of adsorbed oxygen atoms, or discharged anions rich in oxygen, such as would naturally form on the surface of an anodically polarised anode. This layer of oxygen atoms forms a connecting link between the solution, or corroding agent, and the metal. By reducing the discontinuity at the interface it reduces the interfacial energy. Surface concentration of the oxygen atoms is determined by the P.D. existing at the electrode. This conception explains admirably the hindrance caused to the entry of metal into solution, and, substituting hydrogen for oxygen, the cathodic phenomen of overpotential. At the same time, it does not require the invention of hypothetical oxides on anodes or hypothetical hydrides on cathodes, which have previously been postulated to explain these surface phenomena.

The Energy of Gaseous Molecules.

At the same meeting Prof. J. R. Partington considered the question of the internal energy of gaseous molecules from the point of view of present conceptions of atomic structure. Seeing that the monatomic molecules of the five inert gases, of mercury vapour and of desiccated iodine vapour, have identical energies, it is clear that the determining factor must be, not the configuration and structure of the atomic nucleus, but the manner in which the molecule is built up of the nuclei of its constituent atoms and of surrounding electrons, in other words, the internal configuration of the molecule. A difficulty which now arises is to reconcile the modern conception of emission of atomic energy in definite quanta units with the old theory of equipartition, which divided up the translational and rotational energy exchanged by collisions between molecules among their degrees of freedom. Prof. Partington makes the assumption that on the quantum theory the translational energy is represented with a frequency equal to the collision frequency, and on this assumption recalculates the molecular heat of hydrogen and nitrogen. In the discussion the question was raised whether it is legitimate to apply the equipartition theory at all if the quantum conception be adopted.

Fifty Years on the Leeds Tramways.—Mr. William Taylor, of Hunslet, who, at the age of 70, is a timekeeper in the Leeds Corporation Electric Tramways Department, and now completes 50 years' service with the tramways of the city, has been the recipient of a presentation from his fellow employés, and of a gift of £10 by the Tramways Committee. Mr. Taylor began as a driver of horse tramcars and was one of the first of the drivers of electric cars.

REVIEWS.

The Diagnosing of Troubles in Electrical Machines. By Miles Walker, M.A., D.Sc., M.I.E.E., Professor of Electrical Engineering, Manchester University. Pp. xi+450; fig. 332. London: Longmans, Green & Co. Price 32s. net.

The causes of troubles arising in the continuous working of electrical machinery, leading sometimes to failure, are so various and often so unexpected, that at first sight it would seem a hopeless task to make any moderately complete classification, and base on it a guide to remedy. Yet the author has admirably succeeded in this difficult task and has given us a book which will not only be a useful counsellor to the engineer, who may at a moment's notice have to investigate and if possible find a remedy for a mysterious defect, but also to the designer, so that he may avoid hidden dangers quite outside the orthodox theory of design. The book deals to some extent with theory and design, but only in so far as is necessary to make diagnosis clear and remedies understandable; its main object is to help the man who may be classified as a "trouble engineer." A few words of general advice are given him in the preface and may be summarised in a few words: Find out the facts from personal observation, draw your conclusions from these facts and not from other persons' suppositions; make a list of all possible causes of failure that occur to you; take such measurements as this list may suggest; leave the narrow track of preconceived opinion and take a broad view of the case, including all theoretically possible causes of the trouble.

The author distinguishes between "out-door" and "shop" cases. In the former the natural presumption is that the machine has after erection worked satisfactorily until in course of time the trouble has developed. The investigator would therefore be right in confining himself primarily to faulty material, workmanship, or improper use, but not to defects of design. This simplifies his task compared with a "shop" case where design must be included as a possible cause of trouble. On the other hand, an out-door case is often more difficult, because testing appliances may have to be specially procured, and there is not the same freedom in putting the machine into all possible load and running conditions that obtains in the test room of a dynamo works.

In the introductory chapter the reader is given a list of the most important pieces of apparatus which an engineer, suddenly called to some remote site of trouble, should take with him. It is a rather formidable collection of testing appliances.

In classifying the subject matter the author has adopted the plan of first treating troubles which are common to all types of dynamoelectric machinery, and then those which may be met with in some special machines or in some details of machines generally. Thus Chapter I deals with break-down of insulation (30 pages); Chapter II with overheating (27 pages); Chapter III with low efficiency (47 pages). As efficiency is primarily a question of design, this chapter contains a good deal of important theoretical matter, including accurate methods for testing efficiency. The next chapter is headed "Miscellaneous Troubles," such as want of balance, resonance in turbo-shafts, pulling over by magnetic attraction, and a remedy by splitting the winding into symmetrical parts, bearing currents, loose spider, tooth lamination, punchings, and insufficient grip of fingers. A curious case of the perforation of mica tubes is mentioned and explained on p. 149. In spite of the greatest care it might happen that an almost invisibly small iron filing attaches itself to a coil when it is laid down on a bench. If the conductor is stranded and the minute rod of iron embeds itself between the strands and is firmly held in position by the sticky compound between the strands nothing will happen, but if the iron is close to the inner surface of the micanite tube it may work itself loose and under the action of the armature current and main field producing an elliptical rotating field, begin its destructive career of grinding away the mica. In modern machines the strength of this field may reach 1,500 c.g.s. units, but much less suffices to set up the grinding action. The author estimates that a field of 200 c.g.s. units suffices, and quotes an experiment in which a field of 600 c.g.s. units acting on a particle of iron ¼ milligram in weight ground a hole 0.2 mm. deep in mica in four hours. Iron adhering to the outside of a micanite tube does not penetrate the material; it simply makes a pockmark because it is pulled to the side of the slot. At the end of this chapter we find a dissertation on noise and how to cure it, which leads the author into the domain of acoustics.

Before entering into the discussion of special cases of trouble or that connected with certain details, there is a chapter on the use of vector diagrams. The author has found that only a small proportion of trouble-engineers make use of vectors when attacking alternating current problems. This seems to be due to want of confidence in the answer given by the diagram, and this again is due to the uncertainty as to the direction in which the vectors shall be drawn. To help the reader to a correct application of vector diagrams to polyphase problems the author gives what he calls "some hints" which he has found useful in his own work, but which in reality is an expansion of the basic principles on which vector diagrams are to be drawn. Beginning with the simple circuit and the correct way of using the two-wattmeter method

on a three-phase circuit he plunges straight away into the intricate problem of obtaining balance in all three phases for a single-phase load by the use of choking coils. The subject is difficult, interesting, and of great commercial importance, because of electric furnaces, but the transition from the simple to the complex problem is too abrupt. It would have been better to pave the way by a gradual development from the simple to the more difficult cases. An engineer who is not well versed with vectors—and it is this person whom the author wishes to help—will not be able to follow him in the equalisation of load in the three circuits, nor in the vector treatment of synchronous machines, which follows.

Chapter VI treats of alternating current generators. Causes of trouble to fail to generate sufficient or any voltage, unsteady voltage, magnetic defects, &c., are investigated. On p. 302 will be found a dissertation on the best way to change a two-phase winding on an old machine to the modern three-phase type. Here the method of moments previously explained is of particular value. This is, strictly speaking, a design question, but discovery of faults and criticism of design are so mixed up that rigid discrimination is not possible. The same holds good for the following paragraphs, such as bad wave form, regulation, sharing of wattless load, parallel operation, phase swinging, flywheel effect, damping, and other matters incidental to the use of synchronous generators.

The regulation of d.c. generators occupies Chapters VII and VIII with 53 pages, whilst sparking at the brushes is considered in the following chapter of 22 pages. Here a great deal of very useful practical information is given. The curves on page 307 showing mean contact drop between positive and negative brush for different current densities with no less than 23 types of brush, will be useful to designers.

In dealing with commutation the author confines himself almost entirely to the modern type of machine with interpoles. The method of analysis beloved by mathematical theorists is not much in evidence, but instead we find an easily understandable treatment based on common-sense mathematics and reinforced by experiment, chiefly with the oscillograph.

We next come to the d.c. motor (shunt compound and series) armature reaction, commutating poles, condition of stability, parallel working, and hunting. In the following chapter we are taken to synchronous converters and here the treatment is very exhaustive. The author leads off with the problem of starting, both from the a.c. and d.c. side; next he considers adjustment of voltage, heating of armature winding, converters in parallel on the same transformer, pulsating of armature current illustrated by oscillograms, the twelve-phase supply obtained from tappings on three transformers, hunting, short-circuit effects, flash-over, and other defects. In the following chapter (XIV) the subject is continued and extended to synchronous motor generators, whilst in Chapter XV. we come to the induction motor. Since the book is intended for professional men the derivation of the circle diagram is not included, but there are some useful hints on defects and their cure; also a clear explanation why even at full synchronous speed the closing of the a.c. switch may be followed by an enormous current rush, which may mechanically damage the motor. The explanation on p. 422 of the crawling of the motor due to the seventh harmonic, and why the fifth has no effect will be useful even to the professional reader.

Transformers, not coming under the title of machines, since this indicates moving things, are not included in the diagnosis, but it is rather surprising that the author is silent on two types of motors which have considerable practical importance. These are the asynchronous-synchronous motor, now extensively used, and the a.c. commutator motor, which is already in use to some extent, and promises to come into more extensive use now that America has shown the way.

The last chapter deals with the oscillograph used in commercial testing, and on p. 430 is shown the apparatus used by the Metropolitan-Vickers Electrical Co., Ltd., arranged as a universal testing set. The oscillograph, with all the auxiliary apparatus is mounted on wheels, and can be brought up to any machine to be diagnosed, so that the discovery of defects is made more easy and certain than would be the case if the apparatus had to be specially procured and assembled in each case.

Since the general plan of the book is to deal with defects more or less common to all machinery first, and then elaborate the diagnosis of special cases, it is unavoidable that back references be made. This the author does by referring to previous illustrations but without giving the pages where they are to be found. It would be a convenience if he were to add this information in a future edition. That a new edition will soon be wanted appears certain. The matter is so good, and the get-up in the way of printing illustrations, and a complex index, so attractive that no manufacturer of dynamo machinery can afford to be without it, and as to the "trouble engineer," he will find it invaluable.

GISBERT KAPP.

The Motor Electrical Manual. Pp. 168, illustrated. London: Temple Press, Ltd. Price 3s. net.

The success or otherwise of this kind of book depends largely on knowing what to leave out. Obviously it is a difficult task to compress into 155 small pages a complete education in the principles of electrical engineering from the commencement, together with practical instructions on the maintenance of all the electric appliances used on modern cars; to be really successful the author must combine complete mastery of his subject together with a very able pen; there is no room for waste of words. In the present case the result is that the information on most points is rather sketchy and incomplete; we never seem to get to the bottom of anything; we read a few lines about some piece of apparatus, and are just getting interested when we are switched off on to something else.

The book is stated in the introduction to be for "motor car owners and users," and therefore we look to find information such as most of these readers desire, that is to say, practical hints on upkeep and management, mentioning the principal types of apparatus in use, so that the reader may learn something about his own car, together with a short and very clear dissertation on the theory of the subject, this theory being confined to a few early chapters, and not confused with the practical portions of the text. In the present volume the theory and the practical information are too much intermixed. For example, the principle of induction should have been thoroughly expounded in the course of the first two chapters, and then left alone, only practical examples of its application being given afterwards. Instead of this the idea of induction is rather vaguely referred to in Chapter 3 on the magneto, is again taken up in Chapter 4 on coil ignition, and once more, in Chapter 6, on the dynamo, a return is made to this elementary theory. Readers of this class of book, moreover do not take the subject very seriously; they like a book which can be read easily without too much "heavy thinking." It is essential, therefore, in order to catch and hold the attention of such readers, that the subject should be dished up in such an attractive form that it tempts their appetite and assists the digestion of the more solid nourishment which is (or should be) concealed within. In the present volume no attempt is made to "gild the philosophic pill," but the facts are presented in a rather dry monotonous procession.

The first two chapters deal with the most elementary facts of electrical knowledge, pressure, current, resistance, magnetic fields, &c. In Chapter 3 a big jump is made to the magneto; it is a far cry from the pith-ball-and-vulcanite-rod type of experiment to the intricacies of the actions and re-actions which occur within the high-tension magneto. A better arrangement would have been to deal first with the induction coil. Short descriptions are given of the various parts of a magneto, timing, relative speeds, &c., followed by the inductor, and one or two other types, concluding with some practical hints on the care of magnetos.

Coil ignition is dealt with in Chapter 4, two good diagrams being given on p. 52, and this is the best chapter in the book, though the statement that spark intensity in coil ignition does not depend on the speed of make and break (p. 56) is misleading. The spark is of greatest intensity at low speeds, and weakens with increase of speed, as mentioned in the same book only a few pages further on.

Chapter 5 deals with sparking plugs in principle and construction. Chapter 6 is entitled "The Dynamo—its Action," a return being made here to elementary theory, as previously mentioned. Descriptions of ordinary, and a few special car types are given so far as this can be accomplished in ten pages. Chapter 7 deals fairly comprehensively with accumulators, while the following chapter treats of lamps and switches.

Chapter 9 is devoted to electric starting, short descriptions of single and combined units being given, with an outline of the Bendix pinion gear and hints on upkeep. A few notes on electric vehicles in Chapter 10 are followed by a slight sketch of the Entz transmission. In Chapter 11 electric auxiliaries are dealt with, including electric welding and X-rays, though the owner or user is not likely to have much to do with the latter operations. A useful glossary of electrical terms is given in the last chapter, followed by notes on materials used in the construction of electrical apparatus, with tables of weights, measures, wire gauge sizes, &c.

There are only a few misprints in the book, but an amusing one occurs at the end of Chapter 5, dealing with plugs. Apparently the word plug has sunk deep into the compositor's brain, for he finishes the chapter with the sentence "when the sparking points are too far away from the main volume of mixture there is a tendency for the ignition and combustion to be pluggish." After all, there is only one letter different in the word sluggish!

An index, interleaved with publisher's advertisements, occurs at the beginning of the book. The author's name is not given, no one apparently being anxious to assume the responsibility of being father to this rather dull little orphan. —F.H.H.

Radium Deposits.—*Science* quotes a report to the effect that Prof. Scouppe, of the University of Ghent, has discovered two radium deposits in the Belgian Congo which are said to be the richest in the world. The mineral, which has been named "curite," is to be treated at Hoboken, near Antwerp, and it is stated that one grain of radium will be produced from ten tons of the mineral.

NEW PATENTS APPLIED FOR, 1922.

(NOT YET PUBLISHED.)

Compiled expressly for this journal by Messrs. Sefton-Jones, O'Dell and Stephens, Chartered Patent Agents, 285, High Holborn, London, W.C. 1.

7,174. "Couplings for machines of high-voltage direct-current series system. C. J. Bein and Soc. Anon. des Ateliers de Secheron. March 10th. (Germany, April 15th, 1921.)

7,176. "Antenna systems for wireless signalling." Ges. fur Drahtlose Telegraphie. March 10th. (Germany, March 12th, 1921.)

7,197. "Contact tegs for thermionic valves." F. W. Pellant. March 11th.

7,210. "Electric horns." I. H. Parsons. March 11th.

7,223. "Head-lamps of motor-vehicles." T. W. Simpson. March 11th.

7,229. "Projection arc lamp." F. T. Ashton. March 11th.

7,240. "Protective devices for direct-current circuits." Electrical Improvements, Ltd., L. C. Grant, and R. W. Gregory. March 11th.

7,252. "Electrical fuses." G. A. Cheetham and Metropolitan-Vickers Electrical Co., Ltd. March 11th.

7,258. "Electric incandescent lamps, &c." General Electric Co., Ltd., and J. J. Gracie. March 11th.

7,260. "Electrical separation of suspended particles from gases." P. C. Rushen (Siemens Schuckertwerke). March 11th.

7,265. "Locking-devices for electric safety lamps." E. Sommerfield (firm of). March 11th. (Germany, March 12th, 1921.)

7,278. "Cascade rotary converters." Forges Ateliers de Constructions Electriques de Jeumont. March 13th. (France, April 5th, 1921.)

7,295. "Electric horns, &c." W. J. Gooderidge. March 13th.

7,297. "Electric cables." F. J. Brislee and British Insulated & Helsby Cables, Ltd. March 13th.

7,317. "Electric switches." A. Howes. March 13th.

7,320. "Electric cut-outs." A. J. D. Krause and A. H. Railing. March 13th.

7,321. "Connector for insulated wires and cables." J. B. Belcher. March 13th.

7,326. "Apparatus for electrical treatment of baldness, &c." M. F. Fisher. March 13th.

7,332. "Automatic, &c., telephone switching systems." H. Baron (F. Aldendorff). March 13th.

7,336. "Methods for determining direction of electro-magnetic or electrostatic fields." N. Lea and Radio Communication Co., Ltd. March 13th.

7,345. "Printing telegraph receiver." Western Electric Co., Ltd. (Western Electric Co., Inc.). March 13th.

7,346. "Uniting metal bodies electrically." P. Buckley and Buckley Saunders & Co., Ltd. March 13th.

7,358. "Thermo-electric fabric and process for manufacture of same." A. Negromanti. March 13th.

7,364. "Appliance for increasing audibility of telephones, gramophones, &c." Baron Clifford of Chudleigh (W. H. Clifford). March 13th.

7,366. "Electric furnaces." E. P. Barfield and L. W. Wild. March 13th.

7,369. "Producing commutator bars." A. O. Hinchliff, S. J. Watson, and Watliff Co. March 13th.

7,371. "Unfusible electro-thermic safety devices." G. Gallo, R. Lenner, and P. Parvopassu. March 13th.

7,378. "Registration of telephone calls." A. Watts. March 13th.

7,399. "Indirect lighting." S. Coxon. March 14th.

7,411. "Portable electric lamps." C. E. P. Gabriel. March 14th.

7,437. "Devices for attachment to mouthpieces of telephone transmitters." M. M. Dessau and Plantation Rubber Manufacturing Co., Ltd. March 14th.

7,446. "Apparatus for testing strength of permanent magnets." A. T. Scorey. March 14th.

7,471. "Electric circuit interrupters." Metropolitan-Vickers Electrical Co., Ltd. March 14th. (United States, March 14th, 1921.)

7,472.—"Electrical insulating cylinders." A. P. M. Fleming and Metropolitan-Vickers Electrical Co., Ltd., and E. S. & W. Whiteley, Ltd. March 14th.

7,476. "Manufacture of electric insulators, &c., from ceramic paste." L. A. Cordenot. March 14th. (France, March 21st, 1921.)

7,483. "Inert cells." Ever Ready Co. (Great Britain), Ltd., and C. S. Mummery. March 14th.

7,484. "Electrically-heated mould for finishing stockings, gloves, &c." F. Schuster. March 14th.

7,494. "Amplifiers." J. M. Miller. March 14th. (United States, March 15th, 1921.)

7,509. "Telephone mouthpiece disinfectant." E. C. R. Marks (W. H. Bennett). March 14th.

7,513. "Electric power accumulator." G. A. Bartholomew. March 14th.

7,532. "Induction motors, &c." T. F. Wall. March 15th

7,536. "Call recorders for telephones." E. R. Bickley. March 15th.

7,541. "Electric control of a number of telephones." B. J. Baker. March 15th.

7,548. "Accumulator and accessory cases for motor-cycles, &c." R. H. Playfoot. March 15th.

7,621. "Electric cells." Soc. Le Carbone. March 15th. (France, June 3rd, 1921.)

7,622. "Wet electric cells." Soc., Le Carbone. March 15th. (France, December 9th, 1921.)

7,632. "Glass electrodes for high-frequency electric currents." W. H. Gwynn. March 15th.

7,651. "Means for attaching electric wires to sparking plugs." E. Temple. March 16th.

7,674 "Electric lighting systems of motor vehicles, &c." E. W. Reed. March1 6th.

7,684. "Electric advertising signs." Implitico, Ltd., and H. S. Lambert and W. R. Lambert. March 16th.

7,708. "Control of turbine-driven electrically-operated winding plant, &c." Metropolitan-Vickers Electrical Co., Ltd., and A. Stubbs. March 16th.

7,734. "Electro-magnetic relay." D. C. Crowe. March 16th.

7,739. "Dynamo-electric machines." British Thomson-Houston Co., Ltd., and H. W. Taylor. March 16th.

7,740. "Resilient wheels." British Thomson-Houston Co., Ltd. (General Electric Co.). March 16th.

7,753. "Transformers for wireless circuits." A. P. Welch. March 16th.

7,770. "Electric switch gear of the truck type, &c." W. J. Davis and Park Royal Engineering Works, Ltd." March 16th.

7,771. "Electric switch-point detecting, &c., apparatus." J. Ashton and British Power Railway Signal Co., Ltd. March 16th.

7,774. "Electric cut-outs." A. Baderna. March 16th. (Italy, March 17th, 1921.)

7,775. "Electric cut-outs." A. Badorna. March 16th. (Italy, March 17th, 1921.)

7,776. "Electric cut-outs." A. Baderna. March 16th. (Italy, March 17th, 1921.)

7,785. "Electro-magnetically operated switch mechanism." A. E. Honey and L. Snellgrove. March 17th.

7,814. "Electrically-propelled motor vehicles." C. J. Gordon. March 17th.

7,830. "Electric switch and fuse boxes." F. J. Holton and M. J. Railing and T. Taylor. March 17th.

7,842. "Switching mechanism for telephone, &c., systems." Automatic Telephone Manufacturing Co., Ltd. March 17th. (United States, March 28th, 1921.)

7,846. "Electric contact breakers." A. J. H. Elverson. March 17th.

7,847. "Electric switches." W. Clark. March 17th.

7,852. "Telephone systems." Automatic Telephone Manufacturing Co., Ltd. March 17th. (United States, April 26th, 1920.)

7,855. "Electro-magnetically operated switch mechanism." J. Stone and Co., Ltd. March 17th.

7,859. "Electrical signalling systems." Radio Communication Co., Ltd., and J. Scott-Taggart. March 17th.

7,860. "Oscillating valve systems, &c., for wireless telegraphy." Radio Communication Co., Ltd., and J. Scott-Taggart. March 17th.

7,870. "Multiple control apparatus for electric railways." Akt. Ges. Brown Boveri et Cie. March 17th. (Switzerland, March 17th, 1921.)

7,881. "Electrical massage apparatus." T. J. T. Hodgkinson. March 17th.

7,890. "Electro-magnetic locks." V. G. Murray. March 17th. (British India, March 19th, 1921.)

7,893. "Radio-electric relay and electric signalling." J. C. N. Graafland. March 17th. (Holland, September 23rd, 1921.)

7,902. "Self-propelled floating electric power station. F. W. Raisin. March 18th.

7,933. "Portable electric standard lamps." S. J. Levi and H. Rottenburg. March 18th.

7,939. "Manufacture of zinc cylinders for primary batteries." S. O. Cowper Cowles. March 18th.

7,947. "Control of electric motors for traction." T. Ferguson and Metropolitan-Vickers Electrical Co., Ltd. March 18th.

7,949. "Dynamo-electric machines." British Thomson-Houston Co., Ltd., K. R. Hopkirk, and H. W. Taylor. March 18th.

PUBLISHED SPECIFICATIONS.

The numbers in parentheses are those under which the specifications will be printed and abridged, and all subsequent proceedings will be taken.

1920.

24,988. "Telephonic instruments." E. W. Pattison (Dictagraph Products Corporation). August 30th, 1920. (176,019.)

25,035. "Storage batteries." D. W. Davis. August 30th, 1920. (176,020.)

27,361. "Dynamo-electric machines." E. A. Watson and M.-L. Magneto Syndicate, Ltd. September 25th, 1920. (176,032.)

27,909. "Electrical switching or circuit-breaking mechanism." Cutter Electrical and Manufacturing Co. October 2nd, 1919. (151,939.)

27,917. "Electrical switching or circuit-breaking mechanism." Cutter Electrical and Manufacturing Co. December 24th, 1919. (155,807.)

28,610. "Magneto electric machines." R. Bosch Akt. Ges. October 24th, 1919. (153,294.)

30,389. "Systems of electric motor control." British Thomson-Houston Co., Ltd. (General Electric Co.). October 27th, 1920. (176,052.)

30,638. "Electric heating and cooking apparatus." B. G. Battson. October 29th, 1920. (176,055.)

30,685. "Suspension chains for electroliers and for like electrical purposes." E. J. Perry. October 30th, 1920. (176,057.)

31,182. "Switching apparatus for automatic and semi-automatic telephone exchange systems." D. L. Lienzen and K. Larsson. November 4th, 1920. (176,065.)

32,995. "Insulated tubes." Western Electric Co., Ltd. (Western Electric Co., Inc.). November 23rd, 1920. (176,074.)

33,319. "Train-lighting and like dynamos." J. Stone & Co., Ltd. (W. Heaton). November 25th, 1920. (176,088.)

33,648. "Electric meters." British Thomson-Houston Co., Ltd. (General Electric Co.). November 29th, 1920. (176,110.)

33,665. "Cooking apparatus for use with gas, liquid fuel, or electricity." Svenska Aktiebolaget Gasaccumulator. December 3rd, 1919. (154,604.)

33,717. "Portable electro-magnetic apparatus for magnetising permanent magnets." A. Hewlett. November 30th, 1920. (176,120.)

33,805. "Electric switches." G. Comboni. November 30th, 1920. (Patent of addition not granted.) (176,123.)

33,832. "Electro-magnetic relays." Igranic Electric Co., Ltd. (Cutler Hammer Manufacturing Co.). November 30th, 1920. (176,126.)

33,853. "Wireless electrical signalling and apparatus therefor." H. Wade (H. S. Mills). November 30th, 1920. (176,128.)

33,942. "Methods of protecting electric transformers." British Thomson-Houston Co., Ltd., and H. S. Holbrook. December 1st, 1920. (176,134.)

34,041. "Electric relays and their application to telephone systems." Automatic Telephone Manufacturing Co., Ltd. (Automatic Electric Co.). December 2nd, 1920. (176,143.)

34,218. "Electric switches." British Thomson-Houston Co., Ltd. (General Electric Co.). December 3rd, 1920. (176,147.)

34,543. "Electric light fittings." British Thomson-Houston Co., Ltd. (General Electric Co.). December 7th, 1920. (176,153.)

34,708. "Electric lamp-holders and shade carriers therefor." V. Hope. December 9th, 1920. (176,159.)

35,152. "Coin-actuated signalling apparatus for telephone systems." P. G. T. de Villiers and A. Rogers Jenkins. April 27th, 1920. (162,639.)

35,446. "Electrical apparatus for protection against burglary and the like." E. H. Bock. December 16th, 1920. (176,170.)

36,623. "Measuring instruments for incandescent electric lamps." British Thomson-Houston Co., Ltd. (General Electric Co.). December 31st, 1920. (176,190.)

36,624. "Methods of protecting electric transmission or distribution systems." British Thomson-Houston Co., Ltd. (General Electric Co.). December 31st, 1920. (176,191.)

1921.

373. "Electric knife-blade fuse." A. L. Eustice. March 7th, 1918. (156,497.)

1,124. "Insulators." Metallurgique Electrique (Ancienne Soc. Anon. des Etablissements Vedovelli et Tristley). December 13th, 1919. (157,247.)

1,237. "Arrangement for the suppression of the earth leakage current of high-voltage networks." Siemens Schuckertwerke Ges. May 31st, 1918. (Addition to 157,123.) (157,325.)

1,486. "Crystal detector for wireless telegraphy." A. Bonnefont. November 13th, 1919. (157,778.)

1,844. "Well-globe fittings for electric lamps." Veritys, Ltd., and T. I'Ons. January 12th, 1921. (176,201.)

1,845. "Wall fittings for electric lamps." Veritys, Ltd., and T. I'Ons. January 13th, 1921. (176,202.)

2,110. "High-frequency telegraphy and telephony over wires." Ges. for Drahtlose Telegraphie. January 16th, 1920. (158,198.)

2,260. "Method and apparatus for carrying out electro-chemical gas reactions." Dr. H. Spiel. July 19th, 1917. (158,250.)

3,470. "Adapters for use in connection with electric lighting and other circuits." F. Young. January 28th, 1921. (176,220.)

3,665. "Brush-holders for dynamo-electric machines." E. H. H. Hosier. January 31st, 1921. (176,225.)

6,138. "Secondary electric batteries or accumulators." B. Heap and Chloride Electrical Storage Co., Ltd. February 23rd, 1921. (176,244.)

7,285. "High-tension electrical condensers." P. Bunet. May 18th, 1920. (163,684.)

7,749. "Insulating supports or holders for overhead electric trolley wires." E. R. Myers. March 11th, 1921. (176,253.)

8,448. "Electric heating apparatus." E. Muntwyler. March 19th, 1921. (176,259.)

THE

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Vol. XC.] CONTENTS: April 7th, 1922. [No. 2,315.

	Page
The Chinese Market through Native Students	469
The Lock-out	470
Electricity in Agriculture	471
The Electricity Supply Bill	471
Illuminated Electric Signs (*illus.*)	472
The Australian Market	475
Low-grade Coals for Electric Power Generation	477
Legal...	478
Parliamentary Notes	479
Business Notes	480
Notes...	486
City Notes	490
Stocks and Shares	493
Market Quotations	494
Try Another Way	495
Electro-farming, by R. Borlase Matthews	496
The Daysohms "Utility" Arc Welder (*illus.*)	498
The British Electrical and Allied Manufacturers' Association (Inc.)	499
Correspondence—	
The Uninsulated Return	501
The Cost of Living in India...	501
What's in a Name	501
Iron-nickel Accumulators	501
Commercial Electrolytic Iron	501
Electrical Machinery at the Glasgow Exhibition	501
New Electrical Devices, Fittings, and Plant (*illus.*)	502
Single and Three-phase Commutator Motors	503
New Patents	504
Published Specifications	504
Contractors' Column ... ... Advertisement page xxviii	

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THE CHINESE MARKET THROUGH NATIVE STUDENTS.

As we have repeatedly stated here, the enormous area and population covered by China afford or will afford an almost inexhaustible scope for the activity and enterprise of financiers and manufacturers. China was already a happy, or unhappy, hunting ground for concession seekers a couple of decades ago in the matter of railways, ports, &c.; yet her rail transport facilities are still in a most backward stage of development. With her great natural resources in minerals, China is awakening to the fact that it is necessary further to develop her own industries so as to be able to supply at least a larger portion of the inland requirements in manufactures of various kinds. Some steps have already been taken in these directions, and periodical reports reaching us and quoted in our "Business Notices" under "Chinese Notes" indicate the electrical projects selected by us from a large number of schemes that are being proceeded with, but these are mere bagatelles as compared with what may be expected in future years.

The opening up of new coal and iron ore mines, the erection of further blast furnaces and steel plants and rolling mills, the extension of mechanical engineering works, the establishment of electrical manufacturing works, the promotion of electricity supply for lighting and power purposes, the expansion of the textile industries, all these and many other branches, including the great problems in connection with civil engineering, will place a most acceptable demand upon the engineering resources of those nations which have had the prevision to make preparations for participation in the industrial equipment and expansion of the great country in the Far East.

When internal conditions in China have become of a more settled character and it is possible for a stable Government to exercise control over the country, the financial position there will gradually begin to improve, foreign capital will again flow into the country, and the time will have arrived when the rich Chinese merchants and industrialists will be able to proceed more energetically with the promotion of industrial establishments and other works. But we shall be unwise if we ignore the fact that in the meantime a lot of preparatory work will have to be carried out by those nations which intend to participate in the future development of the country when the stage of stability has been reached.

As in the case of Japan, so in that of China, does the desire exist for native ownership or control to be exercised over the industries which are or which will be brought into existence. Most of the rich Chinese merchants and industrialists were themselves trained in other countries, and the value of their training has so impressed them that they have rendered assistance in the sending of young Chinese to other countries for industrial training in order that they might be able to qualify as managers or assistants in the industries which

have been built up or are in contemplation. But there is a limit even to the financial aid which private Chinese interests are prepared or are able to go to in the dispatch of students to other lands; and it is here that the opportunity arises for a big industrial nation to come in to assist China for mutual benefit, an opportunity not only of receiving Chinese students in manufacturing works in an industrial country, but also of rendering valuable aid in the training of Chinese in technical schools in China herself.

It seems advisable in this connection again to emphasise the fact that the industrial or engineering student of to-day is the works or factory manager of the future, and that his particular training naturally gives him special interest in the use of the plant and machinery made by the foreign country where he received his industrial education or in the equipment with which he had become familiar in a technical school in China. The former consideration was perhaps one of the reasons why the Government of the United States decided to return America's share in the Boxer indemnity, so as to permit of the maintenance of Chinese students in industrial training in the United States. In this connection the *British Chamber of Commerce Journal*, of Shanghai, discussing the question of technical scholarships for Chinese, expresses the hope that the institution and grant of such scholarships will be brought within the scope of the Associated British Chambers of Commerce in China at no distant date, and states that this would be rendered possible if the British Government were also to remit the Boxer indemnity. In this event the Associated Chambers consider that the experience of the Government of India in the matter of the grant of scholarships to Indians during the past twenty years, permitting them to come to England for training, would be an invaluable guide to the Chambers in proceeding with the matter with regard to China.

The prevision of the United States Government in the relinquishment of the Boxer indemnity has been justified by events. A constant stream of Chinese students reaches the United States every year, and over two thousand are studying there at present. In France a similar number is to be found as a result (1) of the formation in Peking of the Chinese-French Educational Community, and (2) of the facilities afforded by the French Government for securing the introduction of the students into French educational institutions and French industrial works. On the other hand, only one tenth of this number is known to be either in England or in Germany. Thus, there should be plenty of scope for the proposal of the Associated Chambers of Commerce in China in the direction of scholarships for approved Chinese students who would be sent for training to Great Britain.

If, however, it is impossible for the time being for various reasons to increase the number of Chinese students in England, the best alternative is to assist in the training of them in their own country; and a fresh occasion is now available for British firms to render aid in this direction in their own common interest for the furtherance of trade with China. According to the *Bulletin* of the Federation of British Industries, the Education Committee of the Federation recently had under consideration the question of the Chunghua Vocational School, which was established in the neighbourhood of Shanghai in 1918, through the efforts of the National Association of Vocational Education in China. The committee decided to recommend the school to the attention of members as a project worthy of consideration both on account of the useful work the school is carrying on and of the excellent opportunity it affords for acquainting the Chinese generally with British methods and manufacturers. Designed to provide vocational education for the Chinese student at home, the *Bulletin* states that with the exception of that at the Hong Kong University, it is the only engineering vocational school in China. This statement naturally implies that the German combined language and engineering school in China disappeared during the war and has not been re-established.

The Chunghua school at present comprises an engineering shop, wood-working, button-baking, and enamelling shops, physics and chemical laboratories, an electro-plating shop, &c., but in view of the wide-spread demand for admission, it is desired to extend the curriculum so as to include electrical and civil engineering, industrial chemistry, textile manufactures and dyeing, toy-making, printing, and other courses in applied science. The tuition is free in all cases, although students are required to pay their own boarding fees, and the necessary funds are largely provided by the sale of the goods manufactured in the school workshops. At present the institution is practically an English school, but, according to a member of the Federation who recently visited it, the Americans are taking a keen interest in the school and are anxious to obtain control over it. The plant is said to be getting somewhat out-of-date, and the school is in great need of new equipment.

The question now is whether the school is to maintain its English character or become Americanised. We should say that it is in the greatest interest of British firms to preserve the English nature of the school and not let any competitors derive the ultimate advantages resulting from the English training at the school or receive the fruits of these labours in the future. For these and other reasons we heartily support the recommendation of the Education Committee of the F.B.I. that British firms should come forward once again (as they did at Hong Kong in response to our appeal) and supply, or contribute towards the purchase of plant and equipment required by the school.

We have discussed this matter again and again in relation to particular markets of the world. Hongkong University's needs were met, there has recently been an appeal in our pages on behalf of Cape Town, and now we have the present requirements of China put prominently before us. We have long felt that British manufacturers would find it well worth their while to consider the whole of the important future engineering markets of the world and elaborate a world policy and organisation to deal enterprisingly with their trade relationships to foreign students—the leading engineer-purchasers or advisers of to-morrow. We are therefore glad to note that in the B.E.A.M.A. the subject of admitting oversea students into its members' works has been carefully investigated, and a publication is being prepared setting out the facilities that are in existence. The number of oversea students in the works in question is extremely small, namely, only 92, and they come from all parts of the world, but chiefly from Australia, Egypt, India, and South Africa.

THE LOCK-OUT.

Last week there seemed, at the time of writing our leading article, to be some reason for optimism; at the time of writing this there is a division among the unions which may be the beginning of the end.

Notices were posted in engineering works connected with the Employers' Federation on Wednesday last week to members of Unions other than the A.E.U., and the notices were to become effective within the week. It soon became obvious that there was disagreement between the A.E.U. and the other unions regarding a basis for reopening negotiations. On Saturday night there was a conference at the Ministry of Labour to consider a new document submitted by the employers on the previous day. On Tuesday the negotiating committee met the Prime Minister, by invitation, and later it was announced that the three Federations of Unions, other than the A.E.U., through their representatives, in-

formed the Prime Minister that they were prepared to accept the employers' revised memorandum as the basis of negotiations if the employers would postpone the lock-out notices which were to terminate on the Wednesday as stated above. Whether the employers will agree to this is unknown to us at the moment. The Prime Minister tried to bring pressure to bear upon the A.E.U., but the latter adhered to their previous decision that as the principles embodied in the memorandum of April 1st were the same as those in the memorandum of November, 1921, which their members had rejected by ballot, the basis was not one on which they could resume negotiations. The Labour house is therefore divided against itself, and it remains to be seen how long it can stand.

From a close study of public opinion, as reflected in the newspapers representing various parts of the country, we are of the opinion that there is no feeling in favour of this lock-out. There is, and we think it is justified, a due appreciation of the difficulties of engineering employers with regard to the shop steward question and the much-talked-of managerial functions. But the existence of some just cause for complaint, and its general acceptance as correct, does not guarantee wise, tactful, or considerate handling of the issue. There is a widespread feeling of impatience and annoyance at this unexpected blow, coming as it does just at the moment when trade appeared to be taking a turn for the better. The employers being the party responsible for the lock-out, and for the repeated breaking-off of negotiations on one pretext or another, it is natural that doubt shall arise as to what lies behind it all. The overtime question can be dismissed; it is obviously the merest occasion for the dispute, and not its cause. As we said last week, no sane employer wants to pay time-and-a-half for less efficient work. The managerial function question is more plausible, but in itself it is not sufficient for what must quite candidly be described as the arbitrary attitude that has been adopted by the employers throughout the whole course of the trouble. The extension of the dispute and the bitterness engendered has led to unreasonableness and displays of temper on the part of the hot-headed section of the workers. *The Communist* urges them to "Fight, damn it, fight!" The Electrical Trades Union suggests butting in with a strike and an attempt to shut down the power stations. No sympathy will be extended to wild nonsense of this kind, but we have learned to take it from whence it comes. We expect better things from the employers; and after we have heard so much during the years of the war about co-partnership, team work, bearing one another's burdens, and what not, it is disheartening to find an absolutely unyielding frame of mind, refusing to discuss terms, but merely presenting them for acceptance.

The Unions still press for the setting-up of an Industrial Court. What the country wants is the facts, and these can be ascertained by an Industrial Court better than by any other method.

Already, as news reports show, some employers are starting to economise with their office staffs. We hinted at the possibility of this early in the dispute. If the technical workers had a really powerful union of their own, some useful opposition to such a move might be organised; but as they have made their bed, so must they lie. If trained technical men will not find the money required for the purpose, if they neglect, as they have neglected, the opportunity of creating and maintaining the needful organisation, they have only themselves to thank when they find themselves out in the cold.

It is to be hoped that the employers will feel such confidence in the rectitude of their side of the case that they will join with the Unions in asking for an inquiry. If not, it is the plain duty of the Government, in the interests of truth and of the nation at large to take the necessary steps to bring the Industrial Court into being. If its findings are unacceptable they cannot be enforced, though there would naturally be strong moral pressure against the side refusing to accept them; but even in this lamentable eventuality the facts, for instance, about managerial functions, their exercise and the amount of interference with them that exists, would be available for the information of the public.

Electricity in Agriculture.

The Institution of Electrical Engineers on Thursday last week enjoyed an exceptional treat when Mr. R. Borlase Matthews described the uses to which he has applied electricity on his 600-acre farm. In addition to ordinary lantern slides, he made excellent use of the kinematograph to illustrate farming operations, not only on his own but also on Continental farms, thus vividly impressing on the minds of the audience the nature of the problems with which the farmer is confronted and the methods which have been adopted to solve them. Incidentally, he also indicated by this means the rapid progress which is being made in the utilisation of water-power in a German province for the generation of electricity; and his demonstration of mechanical accountancy was most effective.

In the course of the discussion (which was to be resumed yesterday, owing to the large number of members who desired to take part in it), Mr. Bernard Jenkin, who stated that he had just completed seven years' "apprenticeship" to farming (how many more electrical engineers are going back to the land?), laid stress on the enormous proportion of transport and haulage met with in farming operations, and drew the conclusion that electricity was eminently unfitted to compete with the internal-combustion-engined tractor. Although Mr. Matthews uses a battery vehicle on his farm, it cannot be denied that Mr. Jenkin's case is a strong one, under existing conditions; but how long will this obtain?

Battery traction has been tried for ploughing and other haulage operations on farms, but is handicapped by the excessive weight of the vehicle, which makes it most unsuitable for use except on metalled roads, while the occasional efforts involved in ploughing call for excessive rates of discharge from the battery, to the detriment of the plates. But when a battery tractor weighing only half or one third as much as the present vehicle is available, capable also of standing up to heavy discharges with equanimity, the situation will be fundamentally changed, and the uses of electricity on the farm will be immensely extended.

The Electricity Supply Bill.

The opposition to the Bill in the House of Lords on Tuesday last assumed a ridiculous aspect. It was gravely alleged that the Bill was too technical and too complicated to be dealt with by the House, and should be referred to a Select Committee, although that House did not hesitate to deal drastically with the far more complicated and technical Bill of 1919 in a couple of days. Scruples regarding the laying of burdens on the ratepayers were advanced by men who in the same breath demanded a procedure involving the expenditure of perhaps £20,000, a delay of many months, and the probable crippling of the work of the Electricity Commissioners for another year at least.

The whole subject has already been thrashed out *ad nauseam*, and the opposition seems to be merely that of interested parties who wish to block the Bill at any cost. However, nine clauses were passed on Tuesday, embodying the bulk of the provisions of importance.

ILLUMINATED ELECTRIC SIGNS.

The remarkable displays of animated electric signs which for some time past have enlivened Piccadilly Circus and other busy traffic centres in London have attracted much attention, due not only to the skill with which they have been designed, but also to the novelty and ingenuity of the movements which they simulate. Some particulars regarding the methods by which these striking effects are produced may be of interest to our readers. The field is one in which electrical methods are not merely supreme, but absolutely without a rival, for by no other means can results be obtained which can for a moment be compared with them.

The use of electric signs is, of course, as old as the incandescent lamp, but it should not be supposed that the subject has been fully developed—far from it. Progress in this country was held back during the years

By courtesy of Aerofilms, Ltd.
Fig. 1.—Piccadilly Circus, London, at Night.

of war for obvious reasons, but even before that period our American confrères had carried the construction of electric signs to a pitch of magnitude and splendour that left us far in the rear, and we have a great deal to learn from them. As a matter of fact, the Piccadilly signs to which we have referred are based directly upon American practice; but on that foundation new ideas and new methods have been superposed, and we hope to see a distinctively "British school" established in this art.

The signs with which we are here concerned were designed and erected by the Electric Sign Department of

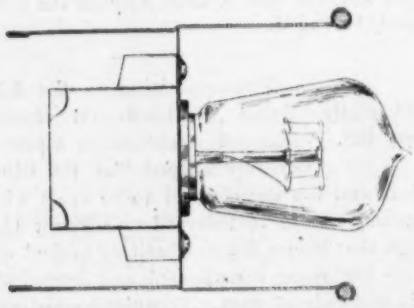

Fig. 2.—Section of Standard Boro' Electric Sign Letter.

the Borough Bill-posting Co., and were constructed in the company's London workshops. Apart from the feature of motion, the signs differ materially in detail from the practice customarily followed; the letters and other elements in particular are much improved in visibility and legibility by the adoption of a channel form, as shown in fig. 2. It has been found that letters composed of lamps projecting from flat surfaces, whilst clear enough from the front, become confused and illegible when viewed at an angle, owing to their mutual interference; by sinking the lamps into channels of sheet metal, this defect is entirely removed, whilst at the same time the lamps are better protected.

Fig. 3.—Electric Signs in Course of Construction at the Boro' Electric Signs Workshop.

The frame work is light but very strong, and the lines of the illuminated letters, instead of being made up of bright points, become continuous, as is well shown in fig. 4, owing to the reflections from the back and sides of the channel, the proportions of which have been determined to suit the sign-type lamps which are used. Incidentally, the channels can be built up in most complicated designs, as illustrated in fig. 3 and other views given herewith.

Fig. 4.—"Boro" Signs at Piccadilly Circus.

The lamps and holders are of course most important features in the construction. The former are made of a particular standard size and shape, and are provided

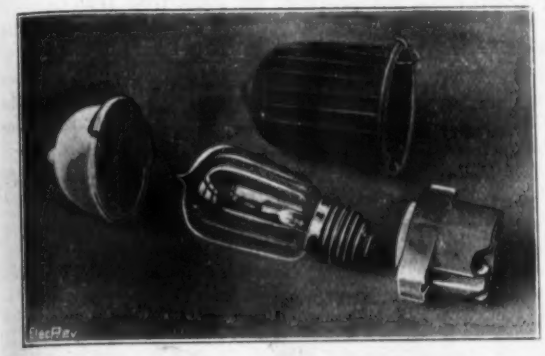

Fig. 5.—Lamp, Holder, Cap, and Hood.

with Edison screw bases, the bayonet holder being entirely unsuitable for this purpose, owing to the narrow separation of the parts exposed to a pressure of 200 or 240 volts. The Boro' practice is to use a special holder consisting almost entirely of porcelain, which is fixed to the support by two screws, and fits the standard screw base. Special provision is made for connecting these lamps in circuit without cutting the leads. In practice this combination is found to give almost complete immunity from faults through short-circuit or leakage.

The colour effects of the Boro' signs are a very noticeable feature, and are obtained by a method that is quite novel. Instead of using coloured lacquers or varnishes, which are quite unsuitable to withstand our erratic weather conditions, or employing natural coloured glass lamps, which are very expensive to buy, limited in their colour range, and involve the keeping of tremendous stocks, use is made of glass colour hoods and caps, which slip over the $1\frac{3}{4}$ in. sign-type lamps and are held in place by spring-wire clips on the bulbs (fig. 5). The colours of these hoods are, of course, quite permanent, and are to be obtained in shades of red, blue, amber, purple, green, and opal. They are in two forms, the more usual of which completely covers the lamp, incidentally affording a very fine protection against the ravages of weather, and fills the entire white letter channel with light of the desired tint. The second type of colour attachment is the cap, which is hemispherical in form and fits snugly over the pip end of the lamp only. Its use is confined mainly to displays having coloured backgrounds, such as the familiar flaming torches or the vivid green plumage of the Strand parrot. When an opal cap is used with the standard white channel letter a very noticeable improvement in the effect is obtained. The series of bright light spots, generally accepted as inherent to all electric signs, disappears almost entirely, and the channel is instead filled with a soft white light of practically uniform value, giving very clear definition over a wide angle of view, while permitting wider lamp spacing than is otherwise necessary. The difference in the effects obtained with the hood and the cap respectively is well seen in fig. 4, where the lamps in the word "Glaxo" are fitted with hoods, whilst the lamps in the other words are fitted with opal caps.

Turning now to the method of imparting the appearance of movement to the signs, we illustrate in figs. 6 and 8 two of the controllers used for this purpose, the former being in the company's workshop and the latter, photographed *in situ*, being the apparatus which actuates the picture of a revolving wheel and other features of the Pirelli sign shown in fig. 4. The controller or flasher, as it is more commonly termed, consists of one

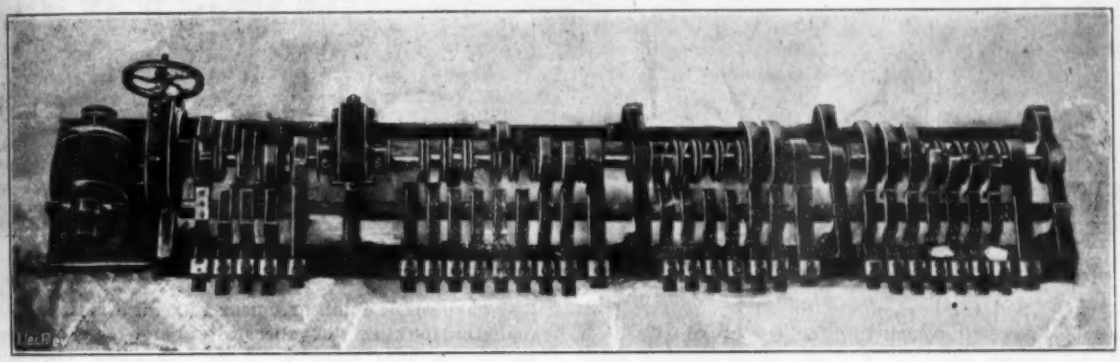

Fig. 6.—A "Boro" Sign Controller.

or more slotted drums mounted on, but insulated from, a spindle driven through worm or spur gearing from a small motor. To these drums segmental contacts of

Fig. 7.—Phases in the Sandeman Sign.

appropriate width and length are attached. Simple brushes of springy sheet metal are clamped to the framework, and adjustments are provided for these, as well

as for the segments, which can be cut to any arc of a circle and set so as to make and break contact at any desired point in the course of a revolution. In the case of a complicated sign such as that shown in fig. 7, several drums of varying speeds are mounted in the same framework, and driven by the same motor; they are interconnected as may be necessary to produce the required sequence. In the sign illustrated in fig. 7, the bottle appears first as full, and the wine-glass empty; "wine" commences to flow from the bottle to the glass, and the level of the liquid in the former is gradually lowered by cutting off successive strata of red lamps, and lighting in their stead lines of opal-capped lamps, while the glass similarly is made to appear gradually to become full by a reversal of this process. The bottle then vanishes, and the name of the brand is illuminated. By suitable disposition of the segmental contacts, the letters can either be written, or spelt out, or simultaneously lighted up. The various components of these controllers have been standardised, so that any combination can be made up from a very complete range of parts which are kept in stock. Although the mechanism may be in operation for several hours a day, it undergoes but little wear, and requires a minimum of attention.

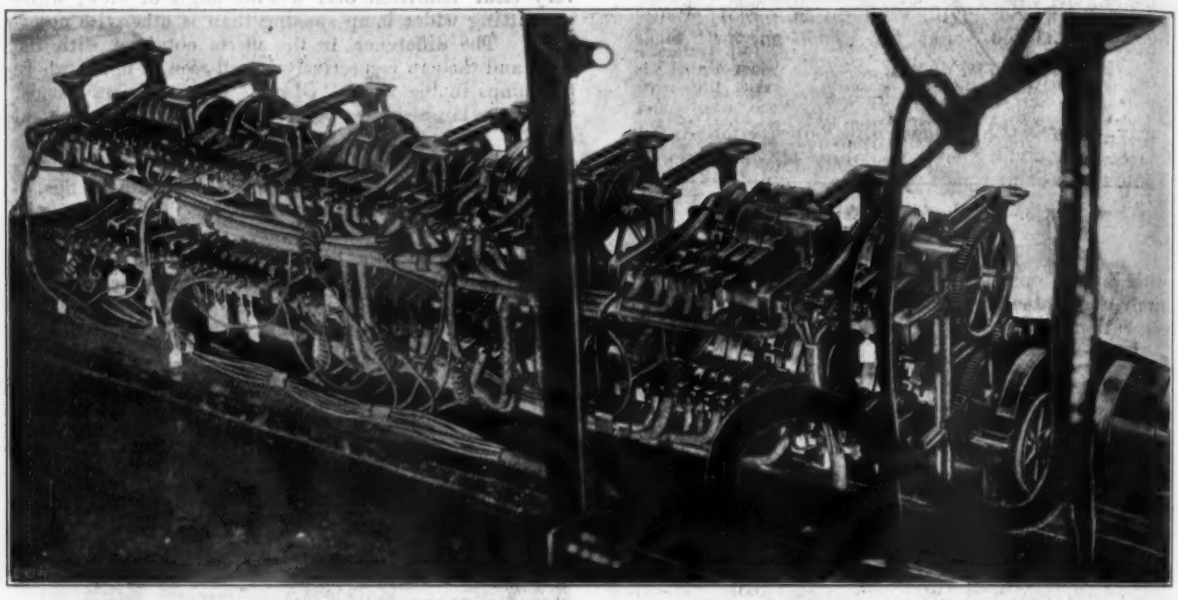

Fig. 8.—Controller Actuating the Pirelli Sign.

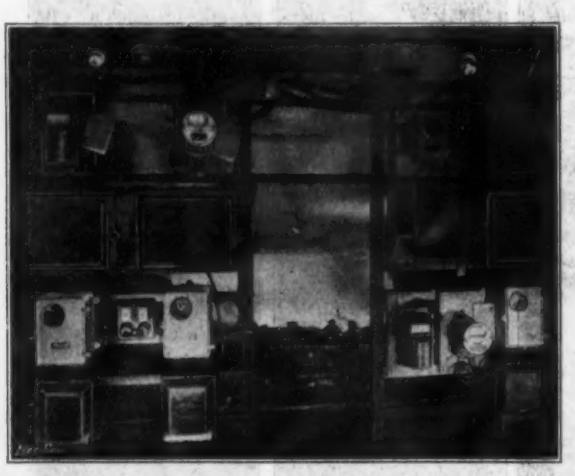

Fig. 9.—A Section of the Piccadilly Installation, showing the Sandeman Flasher and Switchgear.

Fig. 9 shows parts of two of the switchboards installed at Piccadilly Circus, with one of the controllers in the background. The signs are set in operation by Venner time switches, which control automatic circuit-breakers; these, with the necessary fuses and watt-hour meters, constitute the equipment of the switchboard panels, which are mounted on angle-iron frames.

With the resources that we have described, an infinite variety of effects can be obtained; examples in operation to-day, in addition to the one we have described above, are the revolving wheel of the Pirelli sign, the rotating globe of the Coliseum, the brilliantly scintillating garment of a danseuse near Charing Cross, the very realistic fountain in Piccadilly, and the lightning flashes, waving flags, and fancy borders elsewhere. Opinions may differ as to the æsthetic merits of such signs; but there is no question as to their advertising value, or the fascination which they exercise over those who are not familiar with them, and the supply undertakings no doubt appreciate their advantages as consumers of electrical energy. The company responsible for these new departures is to be congratulated on its enterprise, for which there is abundant scope in our great cities.

In conclusion, our thanks are due to Mr. G. P. Garbett, manager of the Boro' Electric Sign Department, for the opportunity to inspect and photograph the apparatus, and for facilities to prepare this article.

An Electric Cotton Picker.—The gathering of cotton is a tedious and lengthy process, and the size of the crop of any cotton grower is dependent upon the amount of labour he is able to obtain. In the American cotton fields it is known that most growers could produce crops three times the size of their present crops if a quicker method of picking were available. According to the *Textile Recorder*, the American General Electric Co. has put upon the market a machine which will revolutionise cotton-picking methods, ensuring greater speed and cleaner cotton, and further, one that will only gather cotton that is fully ripe. The gathering device consists of an attachment to the end of a long suction tube composed of two brushes, which revolve inwards, enclosed in a metal case. These have a comb-like movement, and pull the cotton free without collecting any part of the boll or leaves. The freed cotton is then taken through the suction pipe to a container. This receptacle is mounted on a carriage, and also mounted on this are an engine and dynamo, which supply power to the motors. Just before the cotton drops into the container it is cleaned by a motor-driven fan. There are four picking tubes and appliances to each machine. By the use of this machine picking is carried out four times as fast as by hand, and instead of its taking 1,600 lb. of seed cotton to make a 500-lb. bale of cotton lint, only 1,450 lb. of seed cotton is required.

THE AUSTRALIAN MARKET.

[From a Local Contributor.]

If, in common with all other countries, Australia, at the moment, is suffering from the effects of the world-wide commercial depression, her great natural resources and potential wealth are such that, when the anticipated trade improvement does commence to take effect, she should be one of the first to recover and, therefore, the present may be an opportune time to consider some of the more important aspects of the electrical industry in Australia, with special reference to their bearing upon the British export trade.

For four years or more British manufacturers, with what patience they could muster, were obliged to reconcile themselves to viewing practically the whole of the Australian electrical business going to America and Japan, and, therefore, it may not be out of place to examine, first, the competition likely to be experienced by Britain in her efforts to regain this most important market, and, in this connexion, some statistics of electrical imports obtained from the Commonwealth Government Customs Departmental Returns are set out below. In this table, which otherwise contains some illuminating comparisons of the relative values of certain Australian electrical imports for pre-war and post-war years, it has to be stated that the method of classification—that of the Customs Department—is not altogether an admirable one from the point of view of the proper segregation of classes of apparatus.

Dynamo Electric Machines, including Static Transformers, Induction Coils, Electric Fans and Parts thereof.

	1913.	1918/1919.	1919/1920.
	£	£	£
United Kingdom	273,756	184,161	327,318
United States	141,524	300,574	381,440
Germany	29,553	nil	nil

Starting and Control Apparatus, including Switchboards (except Telephone Boards).

	1913.	1918/1919.	1919/1920.
	£	£	£
United Kingdom	37,250	25,990	47,668
United States	30,763	64,974	73,019

Cable and Wire (Covered).

	1913.	1918/1919.	1919/1920.
	£	£	£
United Kingdom	561,780	146,711	531,978
United States	19,691	112,008	29,237
Japan	nil	301,867	50,881
Canada	nil	51,093	17,828
Germany	80,848	nil	nil
Belgium	19,877	nil	nil

Copper Wire.

	1913.	1918/1919.	1919/1920.
	£	£	£
United Kingdom	175,916	4,063	36,640
United States	10,956	38,875	31,475
Belgium	21,662	nil	nil
Germany	4,396	nil	nil

Accumulators or Storage Batteries.

	1913.	1918/1919.	1919/1920.
	£	£	£
United Kingdom	121,721	10,750	44,520
United States	8,929	100,872	77,038
Germany	31,375	nil	nil

The competition to be expected by British makers may be classified into American, Japanese, other foreign and, finally, local.

America always had a considerable share of the Australian electrical business even before the war, but a reference to the foregoing tables will show that the war enabled America to establish herself in this market more firmly than ever; this is most apparent in the first two groups of the table. Australian conditions closely approximate to those obtaining in America, and American practice is being increasingly followed here, in support of which statement and without going into detail, the Victorian Government's 132,000-volt transmission line (Morwell scheme) and the Tasmanian Government's 88,000-volt line may be cited. Outdoor transformers are employed and outdoor switchgear is being more frequently called for; overhead lines are universal, except in the business quarters of the cities.

These factors, combined with the customary American energy with regard to canvassing and propaganda, *plus* their bulk production and general standardisation methods, greatly assist the Americans to retain their business in this country.

The Electrical Review for October 20th, 1916 (p. 433), published some interesting extracts from a report by the United States Consul on the position of electrical affairs in Australia as it appeared to him, and, although this is an old report, it can be profitably referred to again, while a recent statement by Mr. Ferrin (late American Trade Commissioner to Australia) is of particular interest just now, especially following upon a recent American loan to an Australian State Government—the first loan obtained from without the Empire. Extracts are given below from Mr. Ferrin's statement (quoted from the *Sydney Morning Herald* of November 10th, 1921):—

"Mr. Ferrin said yesterday he would like to see American capital represented more largely in the development of Australia. The interest rate in America was declining, and there was every indication that money would accumulate there for investment abroad. . . . *The position in Australia was probably sounder than in any other country that had been affected by the war* (my italics), and it seemed to him that there were abundant opportunities for the profitable use of capital. . . . Mr. Ferrin said the imports into Australia from America had increased very largely during the past few years, and last year were valued at £30,000,000, as compared with £15,000,000 in 1919, and an average of £5,000,000 a year before the war. Owing to the exchange position and other factors, that, in his opinion, were only temporary, trade had declined during the past few months, but it should increase materially in the future. . . . There is a possibility that some of the large manufacturing concerns in America might establish plants in Australia, and that might become a strong probability if the Commonwealth Government were to offer concessions in the shape of a reduction of the duties on, say, the machinery required to be imported here to equip these plants."

On the other side of the ledger is a strong prevalent feeling in Australia that her destiny is irrevocably joined with that of the United Kingdom, and that it is necessary to do everything possible to re-establish trade relations within the Empire, and this patriotic attitude is evidenced by the fact that while, in the past, loans raised in London were frequently largely expended in the purchase of plant in America, it is now the practice for certain Government Departments and also municipalities to give a definite percentage of preference to British manufactures as against foreign makers, over and above that secured by the tariff. This, however, has to be considered from a wider aspect, as a similar preference is granted to the Australian manufacturer over the British, and this, in a country where political and party influence in the settling of more important contracts is at times in evidence, should not be overlooked.

If America is the most formidable competitor with regard to plant and apparatus, Japan is, *at present*, to be reckoned with so far as accessories are concerned.

In the mercantile sense, Japan made the utmost of the war situation, developing her foreign trade to an enormous extent. Considerable business in electrical supplies of all kinds, but principally lamps, wires, and cables, and general accessories was done in Australia during the war, and once again a reference to the foregoing table will prove of interest. If, generally speaking, the quality of the goods and the conduct of business originally left a great deal to be desired, it has to be admitted that improvements in both respects have been made, and the Japanese Government, realising that past business methods have not always been above reproach and jealous of the good name of Japan, is alleged to be

taking steps to ensure that there shall be fewer transactions calculated to be irritating to the customer.

Not only did Japan cater for the small accessories, but quotations were made for more important plant, such as transformers, motors, and pumps, and, if they did not secure any business in this apparatus, it indicates the scope of their recent enterprises, while it is the fact that they have supplied to Australia a 20,000-volt paper cable.

These facts speak for themselves without laboured comment. It is sufficient to say that Japan is wide awake and keen to a degree. She is developing her considerable mineral resources and building up her manufacturing industries as rapidly and efficiently as circumstances permit, in connection with which it must be remembered that there is the added point that American capital has established various electrical enterprises in Japan.

However, admitting all this, past experience seems to support the idea that, save in the very cheapest lines, Japan will not recover her war trade unless British makers unthinkably sacrifice their well-earned reputation for quality, and this opinion is supported by the very strong feeling in Australia against coloured labour and also by the fact that Japan, in common with Europe and America, is experiencing her labour troubles.

The other foreign competition may be expected from the usual sources, namely, Sweden, Switzerland, Italy, Holland, Denmark, and Belgium. Most of the leading electrical manufacturers in these countries are more or less adequately represented in Australia, and, in at least one instance, that of a well-established Swiss firm, steps have been recently taken to open an Australian office. The Dutch lamp manufacturers are strongly entrenched here, but recent developments may alter that position somewhat. As regards former enemy countries, the Australian Government until recently stood alone in prohibiting commercial relations, but it has recently sanctioned the resumption of trade relations with Germany as from August 1st next, at which date it is only to be expected that every effort will be made by German manufacturers to get a substantial share of the Australian business. Coupled with this decision of the Federal Government is a statement that special precautions will be introduced to prevent "dumping," but it remains to be seen if these will prove efficacious.

We next have to consider what competition the British manufacturers may expect to meet with from the Australian factories which are engaged in the manufacture of electrical plant and appliances. Prior to the war, Australia was ill-equipped from a general manufacturing point of view, and this, coupled with her remoteness from the world's manufacturing centres, caused her much inconvenience. Forced to depend more and more upon her own factories, there were numbers of enterprises, large and small, started in most engineering sections with considerable extensions to those already established. An instance may be cited in the Broken Hill Co.'s Steel Works at Newcastle, employing over 5,000 men. The electrical branch was not overlooked, and both in Victoria and in New South Wales factories of considerable importance have been extended or established. In this and in other of the Australian States there is a host of small factories, turning out transformers, meters, switchgear, motors, conduit fittings, heating appliances, &c. That the manufacture in Australia of important electrical plant is regarded seriously is evidenced by the fact that Government and municipal contracts for turbo-alternators up to 12,000 kW have been placed, and, admitting present dependence upon parent or other British factories for designs or supply of parts not readily to be made in Australia, it is evident that Australian competition cannot be lightly disregarded. As showing only one aspect, there is at Port Kembla (N.S.W.) a factory largely devoted to the manufacture of bare copper cables. This factory turns out practically the whole of the bare copper cables used in Australia, the great majority of which before the war came from Britain.

Then we have a factory noted for the manufacture of dry core telegraph cables; this concern is already in receipt of a contract from the P.M.G.'s Department approximating £230,000.

However, it has to be stated that the sparseness of Australia's population *plus* the scattering of these few millions over the seaboard of a Continent and the consequent difficulties preventing that mass production possible in a closely-populated country will, in the writer's opinion, prevent any *marked* success for Australian electrical manufacturing enterprise. Local and qualified success there must be, but there seems to be every indication that Australian manufacturers will shortly be called upon to fight for their very existence. This refers, of course, more particularly to the concerns established since 1914.

The tariff has been increased considerably, and, as regards the principal electrical apparatus, now reads:—

	British Preferential Tariff.	Intermediate Tariff.	General Tariff.
Copper wire (bare)	30%	40%	45%
Switchgear, transformers, generators, motors, heating and cooking devices, fans, &c., &c.	30%	35%	40%
Filament lamps, per lb. ...	1/-	3/-	3/-

Notwithstanding this heavy protection, the Australian maker recently has frequently found his inability to compete with the imported article, and it appears that nothing short of a further very heavy increase in the tariff will be of any avail, and that is not likely to happen in the present political position here.

Labour troubles in Australia are probably as acute as anywhere else (the miners are now calling for a 30-hour week and a minimum wage of £8), and labour legislation is very far-reaching in its effects; class dissension is preached to a high degree, and altogether these influences must have an adverse effect upon local industries. Such conditions as prevail seem to prohibit the Australian manufacturer of electrical appliances from developing an export business.

As an instance of what manufacturers have to contend with, the N.S.W. Labour Government has legalised a 44-hour week in many industries, and is proposing to introduce a Bill designed to prevent the automatic reduction of the basic wage found possible by the Board of Trade. While the Board of Trade increased the basic wage when the cost of living was mounting, the manufacturer had to observe and pay the increased award, but the moment the Court finds the lower living cost renders a reduction in the basic wage possible, the Government proposes to introduce a Bill to render the Board of Trade's decision null.

Considerable confusion exists, too, in overlapping awards of Federal and State Arbitration Courts.

There is further to be considered the point that, in the opinion of many good judges, the Australian manufacture of electrical plant and appliances is in grave danger of being overdone. The comparatively limited market will not for many years provide sufficient work for the various factories already established or contemplated, and the possibility of expensive workshop plant lying idle for considerable periods of time through lack of orders is a factor to which, it is sometimes claimed, sufficient consideration has not been given. For reasons already stated, the Australian manufacturer is not able to go in for mass production, and his acquisition of workshop efficiency must be through the same expensive process as the older-established concerns, namely, bitter experience.

At this stage an interesting point may be made with regard to a Royal Commission held a year or two ago on the Navy Department; speaking of the cruiser *Brisbane*, built at Cockatoo Island (N.S.W.), the cost of which was stated to be £746,459, the Commission reported:—

Obviously this does not include the full cost of the ship to the Commonwealth, as no charge has been included either for depreciation of plant or for interest on capital. We have

ascertained that a ship similarly fitted could at that time have been purchased from the Admiralty for £331,000. While it is neither within our province to comment upon, nor in conformity with our personal opinions to criticise, the policy of the local ship construction, we think the public should know the additional cost involved.

We may next consider the general commercial possibilities for the future. Australia's position amongst the self-governing Dominions from the point of view of future potentialities ranks very high, and, with a return to normal conditions, she should be amongst the first to set in train the various schemes retarded by the war or by the present depression. A sound immigration policy has been inaugurated, and within a decade great strides should have been made towards that considerable increase in population which is Australia's vital necessity. Lord Northcliffe realised that during his recent visit, and may be expected to do all within his power to support a sound policy for bringing to Australia the desirable immigrant.

From the electrical aspect, it is quite impossible to gauge the developments which may be expected within the next decade, but it may be said, without danger of exaggeration, that with the increased population and the world's finance on a sounder footing, electrical business will boom as never before. The Victorian Government has placed important contracts for the development of the vast Morwell brown coal deposits; this scheme is intended to supply Melbourne and the intervening towns on the route. Many other State Governments have large irrigation and hydro-electric schemes in view which are only delayed by the question of finance.

Considerable attention has been given recently to the necessity of making country life in Australia more attractive, and so prevent the rush to the cities, and in that effort, electricity must play its part in the scheme. Even so, there is little doubt that the capital cities must extend considerably in all respects. Sydney aims at becoming the second city of the Empire, and is content with little short of the most modern ideas. Her White Bay generating station (for the tramway system) is one of the most modern and up-to-date stations in existence.

Queensland is regarded by many as the coming State in view of her still largely untouched mineral, agricultural and pastoral resources.

In Melbourne and Newcastle, existing cable and steam trams must ultimately be superseded by electric trams.

Small townships will almost invariably have an electricity supply, and it is the rule rather than the exception in Australia to find the "juice" in such small communities as would, in England, still stand by oil; this is, of course, due to the almost complete absence of irritating restrictions regarding way-leaves, &c.

Country-house work provides a promising field, and some thousands of self-contained auto-lighting plants have been sold for "stations" and similar establishments.

To sum up, it may be said that Australia's primary products are capable of huge extensions, even if all of her wool, wheat, meat and mining trades are at present under the heavy commercial weather. Her powers of recuperation, even after devastating droughts, are so marked that Australia's future is assured.

Taking all in all, there is every incentive for the British manufacturer of electrical material and apparatus to put forward his best effort to regain and extend that Australian business so laboriously built up and shattered during the war. It will not be done without serious and consistently applied effort, plus continued close attention to details. Every effort must be made to see that quality is maintained, as Australia's standard is high, and nothing short of the best is of any use for this market. It is to be stressed that the Australian Customs Department regularly opens up shipments of such diverse importations as boots and vulcanised rubber cables, and carries out various tests; those on boots need not interest us, but cables are tested to see if they come up to the labelled description and, if they fail to pass the test, the whole shipment is returned to the country of origin.

A good deal has been written about the trade war after the war, with particular reference to the export trade, and there has been more than the usual criticism of British conservatism and its detrimental effect upon British commerce in Colonial and foreign markets. Although there is a certain amount of exaggeration in this criticism, made principally by those who have not sufficiently considered the recent industrial tribulations in Britain, it has to be admitted there is an element of foundation for the adverse criticism in question.

British makers must put their organisations on the most efficient footing, with special steps to see that their agents and branch offices are strongly supported in every way; the latter is of paramount importance, and it is to be emphasised that 12,000 miles cannot be adequately served per cablegram.

In conclusion, the following extract from *The Times* may be of interest. In a leading article referring to the zinc contracts it asks:—

How did Germany manage to secure a monopoly of Australian ores? The true answer is that we were asleep, and the Germans very much awake. Our manufacturers did not trouble about the source of the zinc supplies so long as they obtained what they wanted. On the other hand, the Metal Gesellschaft spent hundreds of thousands of pounds in discovering special smelting processes, while we did not spend a penny. Concentrates had not come here because we were unable to handle them with equal advantage. This was proved in 1914 and 1915, when thousands of tons of intercepted concentrates lay for months unused in British ports, owing to the absence of plants for treatment.

Had we shown the equivalent of German alertness, enterprise, appreciation of research and capacity for organisation, continues *The Times*, the zinc industry would have been developed by Australian and British instead of by German capital, and ore would have been smelted on the spot or in Britain. The need for Mr. Hughes's sharp sword and our belated efforts to spur on our metallurgists would not then have arisen.

If, hereafter, concludes *The Times*, we develop that technical knowledge which will enable us to treat ores as cheaply as Germany and Belgium, our hold on the industry will be absolute and unshakable at every point.

LOW GRADE COALS FOR ELECTRIC POWER GENERATION.

In a paper read before the Society of Arts on Friday, February 24th, Professor W. A. Bone, F.R.S., professor of chemical technology at the Imperial College of Science and Technology, discussed the utilisation of brown coals and lignites, and the steps which are being taken in Australia towards the production of cheap electric power by this means. In the Latrobe Valley, Victoria, Australia, there is an area, 50 miles long, which is estimated to contain, within 1,000 ft. of the surface, over 31,000,000 tons of brown coals and lignites. These are low-grade fuels, which contain something like 50 per cent. of water in the raw state, but by a drying process the water content can be considerably reduced. In 1917 the Advisory Committee appointed by the Victorian Government to investigate the possibilities of generating electric power on a large scale from the Morwell coal (in the Latrobe Valley) reported that, notwithstanding its low grade, power could be more cheaply generated from it for the City of Melbourne than from black coal imported from New South Wales. It was officially estimated at about that time that the cost of producing raw Morwell coal at the mines would not exceed 2s. 9d. per ton, and that it could be delivered by the then existing railway in Melbourne (97 miles distant) at 7s. 8d. per ton, against about 20s. for black coal from New South Wales. Things are now moving rapidly on the lines indicated in the committee's report. Large-scale steam trials are in progress, with a view to ascertaining how the coal may best be burnt under boilers, and a large electric power station scheme at Morwell is now materialising, with every prospect of success, in connection with which a large order for water-tube boilers was recently placed in this country. As a result of all these developments it is anticipated that in a few years hence, not only will the City of Melbourne derive the whole of its electric power from Morwell coal, but also the Victorian State Railways will be worked electrically by energy generated from the same deposits.

Researches have been carried out by Prof. Bone in the direction of the heat treatment of these fuels below 400 deg. C. as a possible method of enhancing their fuel values, and

it has been found that such treatment affords a ready means of up-grading such coals, and of improving their fuel values generally. Also, Prof. Bone got into touch with the Underfeed Stoker Co., which designed and patented an apparatus for the purpose of both drying and up-grading the fuel continuously in one operation, using only the sensible heat in the burnt gases passing away from a boiler. He exhibited a diagram showing the general arrangement of a water-tube boiler with a mechanical stoker fitted with one of such attachments as designed by the Underfeed Stoker Co., which has been installed by the Victorian Government Electricity Commissioners at Morwell, and is now undergoing systematic trials there under the supervision of Mr. H. R. Harper, their chief engineer. One of the principal advantages which it is expected will be gained by the use of such a fuel improver in connection with big power-station boiler installations, such as that at Morwell, where a low-grade, but cheap, brown coal must be used, is that by so drying and up-grading the fuel before burning in the boiler grate it will give a much hotter and more radiant fire than it would otherwise do, with a consequent increase in both the steam output per boiler and the thermal efficiency of the system as a whole. Indeed, in submitting its scheme for the Morwell contract the Underfeed Stoker Co. guaranteed that nine boilers fitted with its new fuel improver attachment would give the same steam output as twelve boilers fired with the untreated fuel, and with a greater thermal efficiency. Judging by the results achieved so far, it seems probable that the anticipations of the company will be fulfilled.

During the discussion which followed the reading of the paper Mr. John McWhae, the Agent-General for Victoria, said it was anticipated that early in 1924 electrical energy would be supplied from Morwell throughout the whole State. It was calculated that they would be able to supply electrical energy to manufacturers at £4 8s. per horse-power year, and at the mine mouth, £2 17s. 6d. per horse-power year. The prospect in Victoria was a magnificent one.

LEGAL.

W. Smith (Camberwell), Ltd., v. Sugden.

In the King's Bench Division before Mr. Justice McCardie, on March 28th, plaintiffs, of Denmark Hill, sued defendant, trading as W. H. Sugden & Co., of Barking, claiming damages for alleged breach of contract for the sale of an electric motor or for alleged breach of warranty in respect of the sale of the motor in June, 1920.

Mr. Gover, for the plaintiffs, said the action was by plaintiffs for breach of warranty on the sale of a second-hand electric motor, plaintiffs giving notice to defendants of the express purpose for which they required it. Defendants traversed these statements, and denied the warranty or the breach. Plaintiffs were builders and contractors, and they had a contract for a client at a house about eight miles from Boxmoor Station. Part of the work consisted of the installation of pumping plant which plaintiffs put out to contract with another firm. They calculated the work the pump would have to do, and they were satisfied that they would want a motor of 1,000 revs. per minute. There was no time for plaintiffs to get a new motor, and though they had offers and could have got motors of higher powers, they could not get one of the power they required. They heard that defendants had a motor of the kind they required, and in June they informed defendants that the sub-contractors had specified for a motor of 1,000 revs., and they explained to defendants the purpose for which they required it. Thereupon defendants, who were electrical engineers and manufacturers, assured plaintiffs that the motor was a 1,000 revs. per minute motor, and showed them a plate on the machine which showed it to be "h.p. 3, 1,050 revs., 110 volts, direct current." After being satisfied that the motor was in proper order, plaintiffs bought it for £45. It was sent to the sub-contractors, who fixed it as part of the pumping installation. After it was wired and running, it made a good deal of noise, and the engineer calculated that it was running at 1,600 revs. Finding it to be unfitted for the work it was required to do, plaintiffs had to obtain another motor in order to prevent a breakdown of the pumping installation. In February, plaintiffs wrote to defendants that they intended to return the motor because it was not in accordance with the warranty, but defendants refused to take it back.

Evidence having been given,

Mr. Woodgate, for the defence, said his contention was that there was no warranty and no breach. Defendants were dealers in second-hand motors. They agreed to supply plaintiffs with a second-hand electric motor, and the motor was approved by plaintiffs' representative after inspection. Defendants sold the motor as seen and approved by plaintiffs' representative, and did not give any warranty whatever that the motor was fit for the purpose of being used by plaintiffs to carry out their sub-contract. They gave no warranty with the motor whatever.

Mr. Justice McCardie, in giving judgment, said a letter had been produced in which defendants wrote to plaintiffs that by error the motor was stamped 1,000 revs. instead of 1,600 revs. If ever striking corroboration were wanted for plaintiffs' story, it was to be found in that letter. He asked himself what was the explanation of that letter consistent with the defendants' statement now. The more one analysed that the more impossible was it to reconcile that letter with the case defendants now put forward. The only unfortunate letter from plaintiffs' point of view was a letter written by Mr. Smith on February 3rd, 1921, shortly before the writ was issued. That letter was not consistent with the evidence of the witnesses, and if he thought that letter represented the true facts at the time, he should give full weight to it. But the letter was not written to defendants. It was written to the sub-contractors, who were complaining, and four days afterwards Mr. Smith wrote to the same people saying: "The statements I made in my last letter were inaccurate. I made those statements on the strength of a report from defendants." That might afford a complete answer on the part of Mr. Smith to any criticisms directed by counsel for the defence to his letter. His Lordship had no doubt there was a warranty of this 1,000 revs. a minute motor. Was there a breach? It was quite evident at some stage or another this was a 1,600 rev. motor, and an independent expert had put it at 1,450 revs. The only answer of defendants was that the machine must have been altered. He believed that the fact was that defendants did not appreciate the nature of the alteration that had been made at the time the motor was sold. Someone then had altered the machine from parallel to a new arrangement, and defendants not appreciating that alteration sold the motor as if the arrangement were still parallel. There was no question of honesty or dishonesty, but his Lordship was satisfied that there was a warranty, and that there was a breach. The question was, what ought to be the damages? On the whole he thought he would be doing justice between the parties if he assessed the damages at £100. There would be judgment for plaintiffs for £100, with costs on the High Court scale.

Tyler v. Kryn & Lahy Metal Works, Ltd.

In the King's Bench Division, on March 30th, Mr. Justice McCardie heard an action brought by Mrs. Catherine Tyler, a widow, on her own behalf and that of her two infant children, against the Kryn & Lahy Metal Works, Ltd., of Holborn, claiming, under Lord Campbell's Act, for compensation for the death of her husband, Percy Tyler, an electrician, who was killed in an accident at defendants' works.

Mr. Doughty, for the plaintiff, said that the accident occurred on November 15th, 1920, at defendants' factory at Letchworth, the deceased man being killed by being caught on a runner of a bridge crane. He had to climb up an upright and pass between two runners on which two cranes ran, in order to get to the cage of one of the two travelling electric cranes. As his head emerged it was caught by the travelling crane and crushed, and he was instantly killed.

Mr. Justice McCardie, in giving judgment, said he was not satisfied that negligence had been proved against defendants. The cranes and girders and so on were all in proper order, and were so arranged as to comply with every obligation of care, and he saw nothing in the arrangement of the ladder or in the means of access from the ladder to the girder to suggest any negligence at all. He had seen a good deal of factory management and machinery arrangement, but he confessed he did not think that the suggestion for the provision of some kind of collapsible cage or guard, such as had been suggested by counsel for plaintiff, would ever have occurred to any careful factory manager that he knew, and he did not think the suggestion would have been made in this case unless the legal advisers of plaintiff had not exercised their ingenuity to find something. His Lordship, therefore, held that the absence of this extraordinary collapsible cage was not in any way negligence. His Lordship saw no negligence in the methods of work adopted by defendants, and he could not find any negligence against them. With regard to the Factory Act Regulations, in his Lordship's view of the facts there was no dangerous part of the machinery to be found. The movement of the crane itself might be attended with danger, but there was no dangerous part, and he therefore rejected the application of the Factory Acts. In his Lordship's view the accident occurred, not from any negligence on the part of defendants, but solely owing to the negligence of poor Tyler himself. His Lordship exonerated defendants entirely from negligence, and as he found, with great reluctance, that the accident arose solely from the negligence of Tyler himself, he must give judgment for the defendants, with costs.

Mr. Doughty asked for an award under the Workmen's Compensation Act.

His Lordship made an award of £900, and directed that £75 should be deducted towards the costs.

Black Smoke Nuisance.

At the instance of the Poplar Borough Council, the Charing Cross, West End, and City Electric Supply Co., Ltd., was summoned at West Ham Police Court last week for emitting black smoke in such quantity as to cause a nuisance, from its works at Marshgate Lane, Stratford. According to *The*

Times report, Mr. F. A. S. Stern, for the company, said they used 80,000 tons of coal a year. Latterly they had been receiving all sorts and conditions of coal, and at times it had been difficult to avoid a nuisance. Mr. Ratcliffe Cousins made a formal order to abate the nuisance forthwith, and ordered the company to pay £5 5s. costs.

Account Collector Sentenced.

At Bradford, on March 30th, Edward Holmes, clerk and collector, until recently in the employment of the City Treasurer's department, was sent to prison for two months in the second division for embezzling £23 11s. 5d. The money had been collected from the Great Northern Hotel, Laisterdyke, in respect of an electricity account. There had been other items collected on the same day and not accounted for. The defendant expressed his keen regret and blamed drink. He said he had often collected between £400 and £500 per day without touching it. The Chairman of the Bradford Gas Committee and the chief assistant overseer gave the man a good character.

Runbaken Magneto Co., Ltd., v. H. L. Raphael's Refinery.

In this case, according to the *Daily Dispatch*, judgment was given in the High Court on Monday for the plaintiffs. Plaintiffs, of Manchester, claimed from defendants, of Limehouse, London, damages for alleged failure to supply, under contract dated June 26th, 1920, 5,000 body castings, 5,000 inspection covers, and 5,000 collector end plates for magnetos.

Plaintiffs' case was that defendants failed to supply samples by the end of July, 1920, which was a term of the contract, and later repudiated the contract.

To that defendants' reply was that the contract was varied, and samples were submitted within the altered time limit, and that plaintiffs refused to approve them, although this was one of the terms implied. They counterclaimed for £266 for work done on the samples and £85 for loss of profit. The reply of the plaintiffs to this was that the samples were defective.

Judgment for the plaintiffs for £1,000 damages and costs.

PARLIAMENTARY NOTES.

(By our Parliamentary Reporter.)

The Engineering Dispute.—Dr. Macnamara stated, on Monday, with regard to the engineering dispute, that he had been able to arrange on Saturday a meeting between the employers' representatives and the mediating committee, as a result of which a proposal had been submitted to a conference of representatives of the trade unions that day. Discussion on that proposal was proceeding. It would be inadvisable to make any further statement at the moment. In the case of the shipbuilding dispute the result of the ballot had not yet been announced, and pending that he did not think he could make a statement on the future course of events.

Electric-lamp Bulb Imports.—Mr. Raffan asked the President of the Board of Trade if he was aware that a firm of British electric-lamp manufacturers was a party to an application for a duty to be imposed on electric-lamp bulbs imported from Germany; whether his attention had been called to the fact that the only evidence produced to the Safeguarding of Industries Act Committee showing 1921 importation of these goods from Germany, related to a substantial consignment of bulbs actually imported by these complainants themselves, as a result of an order given by them at the time when the coal strike in this country threatened their home supplies; and whether he was aware of this when he referred the complaint to the Committee.

Mr. Baldwin replied: I am aware of the evidence to which the hon. member refers. The position of the firm in question would, I think, be more correctly described as that of a witness called by the applicants than that of a party to the application. The answer to the last part of the question is in the negative. Electric-lamp bulbs were included in the complaint under the general heading of illuminating glassware.

Railway Fares.—Mr. Leonard Lyle asked the Parliamentary Secretary to the Ministry of Transport whether he had made, or intended to make, any representations to the railway companies, both overhead and underground, in favour of reduction of their fares, in view of the decrease in the cost of living and in the rate of payment of labour.

Mr. Neal replied: I have recently been in communication with the railway companies, and am informed that they have before them numerous applications for the reduction of railway rates and charges, and that these are receiving consideration. So far as the underground companies are concerned, I have closely in mind the provisions of Section 6 of the London Electric Railway Companies (Fares, &c.) Act, 1920.

Wireless as Aid to Industry.—Sir Douglas Newton asked the Postmaster-General if he was prepared substantially to modify and relax, at an early date, the existing regulations restricting the use of wireless telephones; and if he would sanction and promote the daily broadcasting, by established and suitably equipped radio stations, of wireless telephone messages likely to prove of value to trade and industry in this country or being of general public interest.

Mr. Kellaway replied: I am entirely sympathetic towards the idea of utilising wireless telephony for the broadcasting of messages of the kind referred to by the hon. member. The whole question is being referred to the Imperial Communications Committee in order that the views of the other departments concerned may be obtained as early as possible.

The London County Council (Tramways, Trolley Vehicles and Improvements) Bill.—In the House of Commons, on March 30th, this Bill was read a second time. It was decided, by 86 votes to 72, to give an instruction to the Committee which is to deal with the Bill, that a proviso should be inserted making the erection of trolley vehicle equipment on, over, under, along, or across any street or road subject to the provisions of Section 23 of the London County Tramways (Electrical Power) Act, 1900.

Lieut.-Col. Assheton-Pownall, who moved the instruction, said that Section 23 of the Act of 1900 gave the borough councils the right to veto a system of overhead traction. The London County Council had made repeated efforts during the last ten years to get round this veto, but without success. They were now trying to get round it again. The Lewisham Borough Council had decided by 28 votes to 8 against the introduction of overhead traction.—Sir P. Dawson seconded.

Sir A. Shirley Benn, in opposing, said that the cheapest and most satisfactory system of tramways that could be adopted must be laid down. The L.C.C. experts said that if the line in question was to be extended to the Crystal Palace and on into Penge it would be necessary to adopt the railless trolley system. That could be adopted for an outlay of £148,000, while the conduit system would cost £600,000.

Major Gray said that in York the railless tramway was working at 6d. per car-mile cheaper than the omnibuses.

Mr. Ammon, a Labour Member, said that the Bill was necessary in the interests of cheap travel, and it was important to support the most economical means of locomotion. In 14 towns and cities in this country the overhead trolley system was in operation, and was abundantly successful.

Mr. Neal, Under-Secretary to the Ministry of Transport, said that the House ought not to give borough councils the power to veto a decision of the House, nor should they limit the decision of a committee. From the point of view of the Ministry, anything which would improve the transport facilities of London was worthy of consideration by the Committee. If the London General Omnibus Co., which petitioned against the Bill, could show a committee that it was willing and able to supply the needs of the district, the case of the opponents of the Bill would be very much strengthened. The amendment, if carried, would kill the scheme.

The result of the division, by which the instruction was carried by 86 votes to 72, was received with cheers.

Railway Electrification.—In the House of Commons on March 29th, Major Kelley asked the Parliamentary Secretary to the Ministry of Transport whether any preliminary surveys had been made for the electrification of railways in the coalfields of South Yorkshire, Nottingham, and Derbyshire, and whether any railway route in those areas was to be electrified.

Mr. Neal replied: I have made inquiries and am informed that the railway companies concerned are not at present considering any project for the electrification of any of their lines in the area referred to.

Edinburgh Corporation Electricity Supply.—In the House of Commons on Tuesday, Mr. William Graham asked the Parliamentary Secretary to the Ministry of Transport whether his department had had under consideration a scheme for the supply of electricity by the Corporation of Edinburgh, to include the city of Edinburgh, the county of Midlothian, the county of East Lothian, and other areas; whether, in the case of East Lothian an application had been lodged for powers in a certain area by the Musselburgh and District Electric Light and Traction Co.; what was the present position of this application; and whether, in view of the fact that the needs of this large area must be considered together, he would arrange that the Corporation of Edinburgh should be heard in the necessary inquiry before any powers were granted to the Musselburgh Co.

Mr. Neal replied: The Electricity Commissioners have given notice of a provisional determination of an electricity district for the area mentioned. The Musselburgh and District Electric Light and Traction Co. have applied to the Electricity Commissioners for a special order extending their area of supply. The Corporation of Edinburgh is opposing the granting of this order, and will have the opportunity of stating its case before the Commissioners.

The Electricity Supply Bill.—The House of Lords on Tuesday gave further consideration to the Electricity (Supply) Bill. On the motion to go into committee, the Marquess of Salisbury asked the Government to agree to the reference of the Bill to a Select Committee for consideration and report. He said that the Bill was a very complicated and technical one, and raised principles which, so far as he knew, had never been accepted in our legislation. It raised questions which needed investigation, such as the extent to which the supply of electricity should be under bureaucratic control, and the extent to which the rates should be used for the purposes of the Bill.

Lord Haldane pointed out that the scheme underlying the Bill had been investigated three times. It did not put a burden on the public, but proposed to make a saving of

55,000,000 tons of coal a year. In London the ratepayers paid through the nose for electricity, and the system proposed, if properly carried out, would be an enormous saving to the public. It would be a great misfortune if this plan were delayed.

Lord Gainford said that we were behind a great number of countries in connection with our electric power, and it was essential that we should have cheap power all over the country. He thought that the best way to secure general agreement was for the matter to be thrashed out by a Select Committee of that House.

The Earl of Bessborough moved an amendment to refer the Bill to a Select Committee.

Viscount Peel, Secretary of State for India, who has charge of the Bill, resisted the amendment. He said that the sole purpose of the measure was to enable the Act of 1919 to become operative. Once it was passed, various schemes prepared by the Electricity Commissioners under the Act of 1919 would be put into effect. It was true that there were 60 amendments to the Bill in the Order Paper, but four only were of substance, and these could very well be dealt with by that House in Committee, and thus avoid the delay of referring the Bill to a Select Committee. To refer the Bill to a Select Committee would be enormously to prejudice its fortunes, even if it did not absolutely destroy its chances of being passed into law this session.

On a division, the amendment was rejected by 42 votes to 40, and the House then went into Committee on the Bill.

On Clause 5, which deals with the powers of authorised undertakers, &c., to give financial assistance, Lord Askwith moved an amendment with the object of preventing local authorities from entering into various monetary transactions set forth in the clause.

Lord Monkbretton said that the Bill would break down if the amendment were accepted. The Bill was considered and agreed to by all parties on the L.C.C., but it was absolutely essential that an amendment of this kind should be put on one side if the L.C.C. were to be able to transfer to a joint electricity authority powers it had with regard to the purchase of electricity undertakings.

Viscount Peel said that he could not accept the amendment, which would wreck the finances of the joint electricity authorities.

The Marquess of Salisbury supported the amendment, which was negatived.

The Earl of Bessborough moved an amendment providing that the council of a county district to which the clause was to apply should have a population of not less than 50,000. This amendment was agreed to.

The Committee also agreed to an amendment moved by the Earl of Bessborough, limiting the annual liability to the proceeds of a rate of 1d. in the £ in the case of a local authority which was not an authorised undertaker. An addition was also agreed to, moved by Viscount Peel, that, in the case of an authorised undertaker, the liability should be limited to the estimated annual amount of capital charges of which it would be relieved by reason of taking a supply in bulk from the joint electricity authority; such estimated amount would be determined by the Electricity Commissioners, whose decision was to be final.

The Earl of Bessborough moved a new clause defining the power of joint electricity authorities to lease undertakings to authorised undertakers. This was accepted by Viscount Peel and agreed to. Clause 9 was added to the Bill.

The consideration of the remainder of the Bill was postponed until Wednesday, April 5th.

Private Bills.—Before the Standing Orders Committee of the House of Lords on Tuesday the Yorkshire Electric Power Co. made an application asking that the Standing Orders might be dispensed with so that additional provision might be included in the Bill, already before Parliament in this session. The Bill seeks additional power for the company and the additional provision is with regard to additional capital. The Committee being satisfied with the reasons put forward, granted the application.

Torquay Corporation.—An application was made by the Torquay Corporation asking that the Standing Orders might be dispensed with in order that it might be permitted to deposit a Bill seeking powers to extend the electricity undertaking and to construct a new generating station. The Committee granted the application.

Wireless Service between India and England.—In the House of Commons on March 28th, Mr. Hurd asked the Under-Secretary for India if an Indian application had been made to the Indian Government for a licence to work a direct wireless service between India and England; who was the applicant; and whether the licence was being granted.

Earl Winterton replied that he had understood that such an application had been received, but the Government of India did not consider it desirable, at this early stage, to disclose the name of the applicant. No licences to private persons for wireless stations between England and India were being granted at present.

BUSINESS NOTES.

Bankruptcy Proceedings.—Nathan Prins, merchant and agent, late of 74, Forest Road, Dalston, N.E.—The debtor had traded in electrical accessories, and under a receiving order made against his estate on March 16th, on the petition of Export Traders, Ltd., the statutory first meeting of his creditors was held on March 30th at Bankruptcy Buildings, Carey Street, W.C. It appears that the debtor is a Dutch subject, and that he came to England in 1912, afterwards being employed by a firm dealing in electric lighting appliances. In the middle of 1919 he began on his own account and dealt in electrical accessories at 74, Forest Road, Dalston. He had no capital when he began that business, but he managed to make a profit of from £3 to £4 a week. The claim of the petitioning creditors, who are the only creditors, amounts to £143, and is in respect of goods supplied, they having obtained judgment against him in November last. The debtor is now engaged as a traveller by a firm of importers and exporters, and he attributes his present position to the drop in the prices of goods and to slackness of trade. He values his assets at £10. The meeting was closed, there being no proposal before it, and the matter remained in the hands of the Official Receiver.

E. Cookson (W. Turnbull & Co.), automobile, electrical, and mechanical engineer, Express Magneto Repair Works, Elizabeth Street and Charles Street, Blackpool.—Receiving order made March 28th on debtor's own petition.

J. F. Ludlow and R. R. Ludlow (Ludlow Bros.), electrical contractors, 196, Church Road, Redfield, Bristol.—Receiving order made March 29th on debtors' own petition. First meeting April 12th, at the Official Receiver's Office, Bristol; public examination April 21st, at the Guildhall, Bristol.

C. F. Nason, electrician, 98, Butt Road, Colchester.—Receiving order made March 27th on debtor's own petition. First meeting April 13th, at 5, Buttermarket, Ipswich; public examination April 26th, at the Law Courts, Colchester.

F. Rawcliffe (F. Rawcliffe & Co.), electrical engineer, 8, Nun Street, Newcastle-on-Tyne.—First meeting April 11th at Official Receiver's offices, Newcastle-on-Tyne. Public examination May 4th at the County Court, Newcastle-on-Tyne.

W. J. Dicken (W. Dicken & Son), electrical engineer, 2, Upper High Street, Bargoed.—First meeting April 13th at 34, Park Place, Cardiff; public examination April 27th, at the Town Hall, Merthyr Tydfil.

Company Liquidations.—Bedesco, Ltd., manufacturers of electric lighting sets, London.—The creditors were called together on April 3rd at the offices of Messrs. Quaife & Tuke, accountants, 155, Fenchurch Street, London, E.C. Mr. A. E. Quaife, who occupied the chair, stated that the company had passed the usual resolution in favour of voluntary liquidation, and had appointed him to act as liquidator. He added that he had ascertained that the liabilities amounted to £1,170, while the net assets were expected to produce £139. The creditors passed a resolution confirming the voluntary liquidation of the company, with Mr. Quaife as the liquidator.

Swift Electrical Ltd.—In the Companies Winding Up Court, on Tuesday, Mr. Justice Lawrence made an order for the compulsory winding-up of this company on the petition of Messrs. Watshams, of 33, King Street, Covent Garden, electrical engineers, judgment creditors, for £122. There was no opposition to the petition.

White Bros. Engineering and Machinery Co., Ltd.—A petition for the winding-up has been presented by Mrs. C. Young, coke contractor, of 5a, Church Street, West Ham, and will be heard in London on April 11th.

Stentophone (Motor Accessories), Ltd.—Winding up voluntarily. Liquidator, Mr. A. H. Treloggan, 310, Alcester Road, Moseley, Birmingham.

Washington & Co., Ltd.—Winding up voluntarily. Liquidator, Mr. H. Rhodes, of Halifax. Meeting April 10th at Commercial Bank Chambers, Halifax.

W. H. Lane Proprietary, Ltd.—According to a Melbourne newspaper, an order for the winding-up of this company, mechanical and electrical engineers, of Queen Street, Melbourne, was made on February 9th by Sir William Irvine, the Chief Justice, on the application of the English, Scottish and Australian Bank. For the bank it was stated that the petition was on the ground that the company was unable to pay its debts. The bank was the principal creditor, the company owing it £8,666. The company did not oppose the application.

Dissolutions of Partnership.—Pyne Manufacturing Co., electrical engineers and manufacturers, Latimer Road, Teddington.—Mr. H. D. Pyne and Mr. P. F. Clark have dissolved partnership. Mr. Pyne will attend to debts.

Brindley & Elbourne, consulting engineers, 110, Victoria Street, S.W.—The partnership between Mr. H. S. B. Brindley, who died on March 28th, 1920, and Mr. E. F. Elbourne, has been dissolved as from that date. Debts will be attended to by Mr. Elbourne.

Trade Announcements.—The Anglo-Overseas Engineers and Merchants, Ltd., and the Anglo-Spanish Industrial Association have removed to Lennox House, Norfolk Street, Strand, W.C.2, where they have additional office accommodation. Telephone No. unaltered: "Central 694."

The Industrial Publicity Bureau, which publishes a series of useful little 300-word folders of an interesting and chatty character for employés (they are called the "P.D.T." (Pay-day Talks) method of securing the goodwill of Labour), has removed its offices from Cardiff to 40, Bennett's Hill, Birmingham.

The Alfo Electrical Engineering Co. is closing down its branch business at Telegraph Road, Heswall.

Mr. Harry Rogers, Friars Gate, Warrington, has opened branch premises at 4, Walton Road, Stockton Heath (to deal with installation work), where he wishes to receive catalogues of electrical accessories, motors, fittings, &c.

The A. & A. Electrical Co., Ltd., of 13, Farringdon Road, London, E.C., has taken over the business of Spicer & Co., Ltd., of Red Lion Street, Clerkenwell, E.C., and it will attend to all accounts and carry on the business under its own name. Mr. S. J. Levi, managing director of Spicer & Co., has been elected a director and appointed manager of the A. & A. Co.

Catalogues and Lists.—Industrial Engineering, Ltd., Poland House, 167, Oxford Street, W.1.—An illustrated pamphlet describing the "Post Stylolectric" pen, an electrical pen for indelibly marking all kinds of materials.

Messrs. Babcock & Wilcox, Ltd., Oriel House, Farringdon Street, E.C.4.—An illustrated pamphlet entitled "Steam Generation," dealing with boilers, stokers, ash plant, coal-handling gear, and other steam-raising accessories.

Enterprise Manufacturing Co., Ltd., Electric House, Grape Street, Shaftesbury Avenue, London, W.C.2.—Net trade price list of cables, conduits, and accessories.

The Midland Electric Manufacturing Co., Ltd., Barford Street, Birmingham.—A well-illustrated price list of switch- and fuse-gear, including the "Paragon," "Kantark," "Glasgow" and other types.

The Alton Battery Co., Ltd., 90-91, Queen Street, E.C.4.—Three leaflets dealing with "A.B.C." accumulators, giving full dimensions and particulars.

Messrs. Higgs Bros., Sand Pits, Birmingham.—Monthly Magazine for April, giving reduced prices of motors and dynamos in stock, notes on the manufacture of these machines, and humour.

The Electric Construction Co., Ltd., Dashwood House, 9, New Broad Street, E.C.—Publication B-495, illustrating and describing the construction and characteristics of multi-speed induction motors (Creedy patents).

The Falkirk Iron Co., Ltd., Falkirk, N.B.—An illustrated leaflet advertising the "Falco Double-Ray" electric heater and toaster. Priced.

Electro-Metals, Ltd., 56, Kingsway, W.C.2.—Leaflet 1001. A well-illustrated description of the construction and working of the firm's electric furnace.

Messrs. Handley Page have issued a wall calendar with monthly slips for the period ending March, 1924. A Handley Page machine is shown crossing the coast line.

Messrs. Walker, Crosweller & Co., 265, Strand, W.C2. An illustrated leaflet advertising "Arkon" dial draught gauges and water column gauges.

Simplex Conduits, Ltd., Garrison Lane, Birmingham.—Price List No. 939, giving illustrations and particulars of porcelain insulators, ceiling roses, lampholders, tumbler switches, and other electrical accessories.

Materiel Electrique Alex. Lefebvre, 9, Rue Arsène Houssaye, Paris (VIIIe).—List of plant for sale (No. 55), including complete generating sets, generators, motors, motor-generators, rotary converters, and all kinds of prime movers. Prices are given in most cases.

The G. & P. Electrical Co., 29, Heathcote Street, Nottingham.—A priced leaflet advertising country house lighting and power plants.

Mr. Robert Crust, 40, Brook Street, Bradford.—An illustrated leaflet dealing with the "Bradford" patent wiring box.

Book Notices.—"Marine Wireless Pocket Book," by W. H. Marchant, pp. vii+177, illustrated, price 6s. net.

"The Dynamo: Its Theory, Design, and Manufacture," by C. C. Hawkins. Vol. I. Pp. xxiv+615, 313 figs. Price 21s. net. London: Sir I. Pitman & Sons, Ltd.

Journal of the Institution of Engineers (India). Vol. I. September, 1921. Calcutta: The Institution. Rs. 50 per annum.

"Electric Accumulators: Their Construction and Management," by B. E. Jones. New edition. Revised by A. H. Avery. Pp. 152; 57 figs. London: Cassell & Co. Price 1s. 6d. net.

"The Structure of the Atom." by S. Miall. 26 pp., illustrated. London: Benn Bros., Ltd. Price 1s. 6d. net.

"Handbook on Controllers for Electric Motors" (29 pp.). St. Louis, Mo., U.S.A.: The Electric Power Club. Price 25 cents.—This is a concise description of various types of controllers and starters, together with details of installation and connection.

"The M. & C. Apprentices' Magazine." Vol. 6. No. 21. Glasgow: Mavor & Coulson, Ltd.—This issue contains, as usual, many interesting articles and notes, including "The Outlook," by Mr. Sam Mavor, and "Reminiscences of a Pioneer," by Mr. Henry Edmunds, M.Inst.C.E.

"The Electrical Power Engineer," Vol. IV, No. 3, March, 1922. London: The Electrical Power Engineers' Association. Price 6d.—In this number appears an article on "The Problem of High-speed Boilers for Power Stations," by R. Royds, M.Sc.; a witty short story, "The Runaway"; and numerous reports of the Association's activities.

Annuaire Officiel des Addresses Télégraphiques, 1922. London: Business Directories, Ltd. (sole agents here for the Paris publishers of the volume). 25s. net, carriage paid.—This is the first issue of a volume of 800 to 900 pages, in which is given what purports to be a full list of French business houses, together with their telephone numbers, codes, and languages used, trade and telegraphic addresses. The volume is in three sections: (1) A general alphabetical list of firms and their particulars; (2) an alphabetical arrangement of telegraphic addresses, &c.; (3) a classified and alphabetical trade index. The directory should be of service to all having business relations with French houses.

"Touring by Motor Coach" is the title of an attractive booklet issued by The Lancashire United Tramways, Ltd., price 1s. It gives the mileage of journeys to beauty spots from various centres, with brief descriptions of the localities visited, and a map of Lancashire and the adjoining counties within a radius of 70 or 80 miles of the headquarters at Atherton.

Brazilian Centenary Exhibition, 1922.—In face of the existing world-wide economic situation, it was hardly to be expected that the response of British manufacturers to the invitation to show at the Brazilian Exhibition, commemorative of the first Centenary of Independence, to be held from September 7th to November 15th next, would be either large or representative; but in spite of serious industrial difficulties at home, the depreciation in value of Brazilian currency, and the consequent trade depression existing in that country, and, above all, of the still high cost of freights to South America (notwithstanding the special reduction of 50 per cent. made by the two British lines engaged in the transport of exhibits to Brazil), participation by British firms, either in the form of special exhibits or of models and transparents in connection with single samples, promises to be not wholly unimportant. In view of the long-established friendship between Brazil and the British Empire, special efforts have been made to bring about official as well as private participation.

It is to be regretted that certain British firms which had practically decided upon participation have now been compelled to withdraw. Their final decision has been influenced by the deadlock in the home engineering trade, continued delays in coal deliveries, and the steady decline in foreign exchanges. On the other hand, preparations which were well advanced for the dispatch of heavy machinery and rolling stock exhibits are still proceeding, and, should no further untoward circumstance occur and certain objections in connection with the site of the British exhibits be overcome, it seems probable that shipment will take place very shortly.

It should be remembered that goods arriving after June next, the ultimate date fixed by the Executive Committee, may be refused entrance; they would thus lose all right to exemption from duties and probably become a complete loss to the shippers, who would be without any right of appeal. Moreover, only fifteen days are allowed for the removal from the country of goods on exhibition, and if any remain after three months they will be deemed to have been abandoned. On the other hand, it is important that intending British exhibitors should know that at the conclusion of the Rio de Janeiro Exhibition (provisionally fixed for November 15th), certain other Brazilian States will hold local expositions, notably Maranhao. Exhibitors should thus be enabled to transport their displays at comparatively small cost to other industrial centres of the Union.—*Reuter's Trade Service.*

Patent Applications.—Applications have been made for the restoration of the following patents:—

No. 5,419 of 1913. Granted to Charles Hilliard Donald for "Improvements in or relating to ropeways."

No. 4,191 of 1915 and the patent of addition No. 117,351 of 1917, granted to Royles, Ltd., John James Royle and George Eric Royle for "Improvements in or relating to steam traps and the like."

A "Relay" Gift.—The Relay Automatic Telephone Co., Ltd., has sent us a neat ash tray. This is of glass, and displays an illustration of a relay, the firm's name and address appearing as a border.

The British Industries Fairs.—A joint meeting of the Council of the Birmingham section of the British Industries Fairs and exhibitors at this section was held on March 29th. Many suggestions for future Fairs were put forward, and some will no doubt be acted upon. It was considered that the month of May would prove more advantageous to the Birmingham section, although it was probably not advisable to alter the date of the London exhibition. A suggestion by the Council to introduce standardised stands was not favourably received, and was on this account dropped. The admission of the public was agreed upon, although only for certain days; a small charge would be made to obviate overcrowding. The transference of the Section to London was not considered feasible, the proximity of Birmingham to the factories being a strong reason for the retention of the present site.

A Glasgow Exhibition.—A Public Health Exhibition is to be held at the Kelvin Hall from July 25th to 28th. The Corporation Electricity and Lighting Committees are participating.

E.D.A. Activities.—We have received another of the bunches of literature which from time to time are sent to us by the E.D.A. This collection of pamphlets, reprints, &c., is quite up to the usual standard in its attention-compelling qualities and interest. A parody of "The Song of the Shirt" depicts conditions very different to those which made the original a classic—a change brought about by the introduction of the motor-driven sewing machine. Many interesting facts regarding cooking—the Cinderella of electrical operations—are given in several leaflets; and in various ways the housewife is taught that emancipation from domestic drudgery is at her hand if she will only use electricity for the tasks which at present make her life a burden.

Wages in the Electricity Supply Industry.—Consequent upon the fall of fourteen points in the official statistics of the cost of living, and in accordance with the national agreement, a reduction of 1d. per hour in the wages of electrical workers takes effect as from April 1st.

Boiler Contracts.—Orders received during the last two months by the STIRLING BOILER CO., LTD., for Indian State railways, municipal, colliery, and industrial authorities, comprise 17 boilers, having a total heating surface of 84,600 sq. ft.

For Sale.—By direction of the Disposal Board, Messrs. ANDERSON & GARLAND will sell by auction on April 25th and following days at Cramlington Aerodrome, near Newcastle-on-Tyne, electricity generating plant, heating boilers, &c.

Lincoln Corporation Electricity Department has a quantity of surplus plant for disposal, including generating sets, engines, boilers, switchboard panels, pump, coal-handling plant, &c.

Gillingham Corporation Electric Light Department invites offers for surplus generating plant, including water-tube boilers, superheaters, feed pumps, condenser, piping, &c.

Edinburgh Corporation Electricity Department has for disposal six generating sets.

By order of the High Court Mr. H. Holmes, of Holmes and Co., in conjunction with Messrs. L. Farmer & Sons, will offer by auction on May 3rd, at Winchester House, Old Broad Street, E.C., the freehold premises, fitted with lifts, central heating and electric power, &c., lately occupied by Messrs. John Brinsmead & Sons, in Grafton Street. (See our advertisement columns to-day.)

Social Events.—NATIONAL ASSOCIATION OF SUPERVISING ELECTRICIANS.—A whist drive and dinner took place at the Mecca Café, Ludgate Hill, on Saturday, March 25th. The company comprised about 70 ladies and gentlemen, past and present members of the Board of Control of the National Association of Supervising Electricians and their friends. During an excellently served dinner, Mr. R. W. Whitley, in a humorous speech, proposed the toast of "The Ladies," to which, much to the amusement of the diners, Mr. W. J. Revell responded on behalf of the fair sex. An excellent musical programme and a most enjoyable whist drive, with Mr. A. J. Stiling acting as M.C., added much to the success of the evening. The promoters, Messrs. W. J. Revell and A. J. Stiling, thoroughly deserved the vote of thanks proposed by Mr. J. M. Crowdy, one of the founders of the Association, while Mr. T. H. Windibank, as chairman, caused much merriment with his humorous remarks when distributing the prizes and delighted the guests with the manner in which he carried out his duties.

The annual dinner of the Willesden District Council's Electricity Department took place on March 25th, Councillor W. A. Hill, chairman of the Electricity Committee, presiding. In responding to the toast of "The Electricity Department," Mr. Blake, the electrical engineer, spoke of the progress made during the past ten years, making special reference to the success of the Council's electric vehicles. A very enjoyable musical programme was provided.

Forthcoming Exhibitions.—The following exhibitions are being organised:—

LONDON.—May 1st to 6th, Photographic Fair; July 3rd to 14th, London Fair and Market.

BIRMINGHAM.—May 25th to June 3rd, Industrial and Commercial Efficiency Exhibition; June 15th to 24th, International Foundry Trades Exhibition.

BELGIUM (*Liége*).—June and July, International Technical Engineering Exhibition. (*Mons*).—November, Commercial Fair.

BRAZIL (*Rio de Janeiro*).—September 7th to November 15th, Centenary Exhibition.

ESTHONIA (*Reval*).—September 2nd to 11th, Agricultural and Industrial Exhibition.

FRANCE (*Paris*).—May 10th to 25th, Sample Fair. (*Rennes*).—May 27th to June 6th, Exhibition and Fair.

ITALY (*Padua*).—June 1st to 15th, International Sample Fair.

JUGO-SLAVIA (*Ljubljana*).—September 2nd to 11th, International Sample Fair.

LATVIA (*Riga*).—June 11th to 25th, Agricultural and Industrial Exhibition.

POLAND (*Lemberg*).—September 5th to 15th, Eastern Fair.

TRIESTE.—September 3rd to 18th, International Sample Fair.

Joint Industrial Councils.—Between twenty and thirty joint industrial councils and interim reconstruction committees for various important industries have been in communication with the Ministry of Labour with a view to obtaining legislation giving power to the Ministry to make binding upon the whole of any industry any wage award or agreement, if so requested by the joint industrial council or interim reconstruction committee concerned. There are instances, it is alleged, where employers have broken away from the joint industrial council, and the machinery has been rendered practically abortive in consequence. The decisions of the Trade Board, when confirmed by the Ministry of Labour, are legal and binding, and while there is no desire on the part of the employers or unions to substitute joint industrial councils for trade boards, it is desired that the machinery of the councils shall be equally effective, and that they shall have similar powers. The Ministry of Labour has replied that the suggested legislation can only come through the efforts of the councils themselves.—*Daily Telegraph.*

The British Electrical Development Association (Inc.).—The following are the names of the chief officers and members of the Executive Committee of the E.D.A. for 1922-23:—

President: Councillor E. C. Ransome, O.B.E., J.P.

Past President: Mr. Hugo Hirst, M.I.E.E.

Vice-Presidents: Mr. Alderman W. Walker, A.M.I.E.E.; Mr. W. B. Woodhouse, M.I.E.E.

Chairman of Council: Mr. Llewelyn B. Atkinson, A.M.Inst.C.E., M.I.E.E.

Executive Committee.—Chairman: Mr. Llewelyn B. Atkinson; *Members*: Messrs. S. T. Allen, A. P. Ambler, A. F. Berry, W. F. Bishop, H. J. Cash, T. W. Cole, A. C. Cramb, R. S. Downe, D. N. Dunlop, J. E. Edgecombe, W. A. Gillott, R. Hardie, H. Marryat, E. A. Marx, L. L. Robinson, T. Roles, E. T. Ruthven-Murray, R. P. Sloan, S. H. Stanley, L. G. Tate, Major H. Clifford Palmer, and Lt.-Col. W. A. Vignoles.

Co-opted Members.—Tariff Sub-Committee: Messrs. W. L. Madgen, P. M. Rossdale, A. N. Rye, and P. D. Tuckett; Domestic Electrification Sub-Committee: Messrs. J. H. Bowden, C. G. Nobbs, I. V. Robinson, and F. Selley.

Mr. J. W. Beauchamp is the director and secretary (15, Savoy Street, W.C.2).

Birmingham Trade.—The annual report of the Birmingham Chamber of Commerce shows that it has a membership larger than that of any provincial Chamber of Commerce, and in its character it is thoroughly representative of Birmingham and Midland industries, and particularly of the hardware and metals, the electrical and mechanical engineering, and the motor, cycle, and gun trades. About 260 new members were elected last year, making a total at the end of the year of 3,496 (and this number has since been much increased). The report claims that the strength of the commercial organisation of the country through the Chambers of Commerce has considerably increased during the year, and that never in their history have they been more useful and powerful.

Young Engineers Leaving for Canada.—An effect of the prevailing industrial unrest was seen at the Liverpool landing-stage on Saturday, when 50 young engineers joined the Canadian Pacific liner *Melita*, bound for Canada, to take up farming in the Western provinces of the Dominion. They hail from London, Glasgow, Liverpool, Sheffield, Birmingham, and Portsmouth, and generally expressed the view that, owing to the uncertainty of work in this country, it had become necessary for them to take up farming as a means of earning a regular livelihood.—*Manchester Guardian.*

Change of Telephone Number.—The telephone number of Sir Charles Bright & Partners, consulting engineers, has been altered to "Bishopsgate 1120" (2 lines).

Economic Conditions in Turkey.—Captain Courthope-Munroe (Commercial Secretary to the British High Commission, Constantinople) in a recent report to the Department of Overseas Trade, sums up his impressions as follows: "In the first report printed after the Armistice it was stated that the whole trend of events in Constantinople had been to carry on somehow in spite of disorganisation until the shortly-expected peace arrived. This is now nearly three years ago, and the end seems no nearer in sight. It is true that the remarkable facility that the Turkish public seem to possess in some way to get over one crisis after another finds the city in certain respects perhaps in a slightly better position at the beginning of 1922. There is no doubt as regards Anatolia that, given internal peace and a stable government, people would be prepared to invest money in the exploitation of its rich resources, even where before the war the risk was great. The solvency of the country, however, is bound up with the Anatolian question. Turkey has a heavy bill of expenses to pay, and this is growing larger each day with the continued Allied occupation, and until both Turkey and Russia are once more at peace it is not likely that the Turkish market will afford much attraction for foreign trade."

Unemployment.—The Ministry of Labour returns for March 20th showed a total of 1,762,076 totally unemployed—a decrease of 30,323 on the week. This was the largest weekly decrease this year, and made a total decrease of 172,000 in ten weeks. There was also a decrease of about 6,000 in the number working "short" time. The returns dated March 27th show a further reduction to 1,739,764.

British Trade in Belgium.—The first all-British co-operative sample room was opened in Brussels on March 28th by Sir George Grahame, the British Ambassador.

The room in which the exhibition is housed is a lofty building more than 50 ft. by 40 ft. in dimensions, and has a large glass roof, giving bright daylight to every corner. The secondary hall measures 40 ft. by 25 ft., and offers advantages where the combination of natural and artificial light is required. The premises, situated as they are, at 9, Rue de Ligne, are right in the business centre of Brussels. The idea of the sample room is, put shortly, to supply a permanent sample and stock room for British manufacturers at, what is, in fact, a nominal cost. The samples displayed are in charge of a competent manager, who replaces, in effect, the commercial traveller of the firm in the ordinary stock-room. Literature, price lists, and full particulars of the goods for sale are stored with the exhibit of samples, and will be handed to and explained by the resident manager. The official opening ceremony was attended by a large and thoroughly representative body of Belgian Ministers and merchants. The Federation of British Industries was represented by Mr. G. H. Locock and Mr. S. Springer.

Sir George Grahame, in opening the showroom, said: "The best chance for a speedy recovery of Europe in present circumstances is for our industrial organisations to work together in order to improve the general situation. It is generally recognised that mutual assistance, the study of each other's methods of industry and trade, could with advantage take the place of the old doctrine of reckless competition. The existence of this permanent exhibition in Brussels, the object of which is to offer facilities to Belgian buyers for inspecting British goods with the least inconvenience, should go far to assist in this direction. We in England rely to a great extent upon the supply of certain Belgian products, just as you, on your part, find it advantageous to rely for others' goods on Great Britain. I hope that the exhibition will serve to form a further bond between Belgian and British commercial interests, which from mediæval times has been of so close and friendly a nature."

M. Van de Vyvere, Minister of Economic Affairs, also made a speech welcoming the establishment of the showroom as a means of fostering closer commercial relations between the two countries.—*Reuter.*

China.—A company to be known as the Ming Yuan Electric Light Co. is being established at Chuchow, Anwhei.

Empire Resources and their Development.—At a meeting of the Council of the British Empire Producers' Organisation, last week, the question of the organisation of the resources of the Crown Colonies was discussed, and it was decided to appoint a committee of representative producers from all the Crown Colonies and Dependencies to consider what steps should be taken:—

(*a*) To promote the development of natural resources and encourage the investment of British capital in the Crown Colonies.

(*b*) To improve means of communication between the said Colonies and other parts of the Empire.

(*c*) To readjust tariff arrangements so as to ensure that the products of such colonies in cases where import duties are imposed in Great Britain should be admitted on special terms, and that the tariffs of the said colonies should be readjusted so as to give the largest preference possible to imports of goods produced in Great Britain.

The Building Trades Exhibition.—This exhibition, which is to be held at Olympia from April 11th to 27th, will include interior arrangements as well as construction, and apparatus for heating, lighting, and ventilating buildings will be displayed. Other exhibits will include machinery for wood-working, metal-working, concrete mixing, &c.

Imports into India.—H.M. Senior Trade Commissioner in India has forwarded to the Department of Overseas Trade an analysis of the imports into India during the nine months ended December 31st, 1921. He states that although the total imports into the country show a very considerable contraction owing to the prevailing depression, the reduction in the imports of British goods is not so great as in the case of our principal competitors. The percentage falling off in American and Japanese imports is greater than in the case of British goods. Java now ranks as the second largest exporter to India, and is followed by the United States and Japan. With regard to machinery and mill work, the outstanding feature of the period under review has been the very marked increase in the imports of machinery of all kinds from 14 to over 25 crores of rupees. In electrical apparatus the total imports advanced from 2.48 to 3.95 crores; British shipments from 1.81 to 2.32 crores; American from .39 to .71 crore; and Italian from .04 to .14 crore. There was a falling away in imports from Japan.

Railways in Brazil.—The Federation of British Industries has recently received a suggestion made by the Federal Inspectorate of Railways in Brazil with regard to the representation in that country of British manufacturers of rolling stock. It is suggested that the interests of British manufacturers would be much advanced by the appointment of a technical expert representative of all British manufacturers, with an office in Rio de Janeiro.—*Financial Times.*

Italian Exhibitions.—An Ideal Home Exhibition is being held in Turin, under the auspices of the Società Idroelettrica Piedmontese and other electrical undertakings, during April and May.

At Milan an agricultural show is to be held from April 12th to 27th. The 700th anniversary of the foundation of the university of Padua is to be celebrated by an exhibition of scientific apparatus from May 14th to 17th. There will be a number of prize competitions.

A French Absorption.—The shareholders in the Compagnie Générale d'Electricité have just sanctioned an increase in the share capital from 50,000,000 to 60,000,000 fr. and the issue of 7,143 new shares of 500 fr. each to the Société de l'Accumulateur Tudor for the assets transferred by the latter to the former.

Russian Trade Developments.—The Russian Trade Delegation has received the following information:—

German lathe manufacturers have proposed to open a Petrograd branch for manufacturing lathes from Russian materials.

A new "Commissariat for Energy" has been established to superintend electricity supplies and the electrical industries.

The recently-destroyed Petrograd telephone station has rapidly been rebuilt and is renewing private telephone installations.

Twenty of the biggest German firms have offered electro-technical materials to the Petrograd Electrical Trust.

The Petrograd economic organisations are preparing for the opening of navigation; 150 commodious stores are ready to accept freights.—*Reuter's Trade Service.*

The German Cable Syndicate.—It is stated that the protracted negotiations between the syndicated cable and insulated wire makers and the ring-free firms have now been brought to a conclusion, the latter, with two exceptions, having joined the syndicate. One of the outside firms is said to be compelled to keep aloof, as its manufactures do not comply with the regulations of the Association of German Makers of Conductors. It is now expected that prices will be increased.

LIGHTING AND POWER NOTES.

Bideford.—Electricity Supply.—At a recent public meeting a resolution was carried in favour of the electric lighting scheme prepared by the newly-formed Electric Light Co. The cost of carrying out the scheme is estimated at £25,000. A system of overhead wiring is being adopted.

Blackpool.—Departmental Administration.—A suggestion has been made that the dual administration of the Blackpool electricity and tramway undertakings should cease, and that two departments should be set up. A proposal to this effect will be placed before the General Purposes Committee at a special meeting.

Brecon.—Electricity Supply.—Application is to be made by the Gas Co. for power to supply the district with electricity. The Council has decided to support the scheme.

Canada.—Queenston-Chippawa Development.—The Hydro-Electric Power Commission of Ontario recently placed in operation the second set of the Queenstown-Chippawa (Niagara) development, having a capacity of from 55,000 to 60,000 h.p. The Commission arranged for the cancellation of contracts for the supply of 25,000 h.p., and the new generating set was placed on half load to meet this demand. Other arrangements and contracts for the supply of power to the Commission were to terminate before the end of last month, which would render necessary the operation of the new set under full load. The third set is being installed, and, it is expected, will be in operation in the course of three months.—*Reuter's Trade Service* (Toronto).

Newfoundland.—The Colonial Legislature has been notified by the Premier of the withdrawal by the Reid-Newfoundland Railway Co. of its scheme for water-power development, &c., along the Humber River, on the west coast of Newfoundland.—*Reuter's Trade Service* (St. John's).

Continental. — Belgium.—La Société d'Electricité de l'Escaut, of Antwerp, which has lately entered into a contract with the municipal authorities of Antwerp for the supply until the end of 1932, of the electricity required for lighting and power at the docks in the northern part of the city, last year supplied electrical energy to a total of 30,059,611 kWh, an increase of 8 per cent. over 1920, at the new generating station at Merxem a 7,000-kW generating set is already in operation, while work on the erection of a second set of 10,000 kW capacity is well advanced. In order to meet the increasing demand for electricity from outside districts the company is preparing plans to extend its distributing mains along the Meuse-Scheldt Junction Canal as far as Turnhout.

France.—The Ministers of Agriculture, Finance, Public Works and the Interior have now obtained M. Millerand's approval of a decree instituting an inter-Ministerial commission for the purpose of drawing up a programme for the distribution of electric power in rural communes and for finding the financial means of carrying out the scheme.—*Reuter* (Paris).

The Minister of Public Works is introducing into the Chamber a Bill authorising the construction at l'Aber Vrach (Finistère Department) of a tidal power station.—*Reuter* (Paris).

Darlington.—Disposal of Profit.—At a meeting of the Electricity and Light Railways Committee it was reported that there was a profit during the year of £4,000 on the electricity undertaking. Of this amount £2,500 is to be used for the relief of the rates and £1,500 added to the reserve fund.

Dublin.—Extensions.—Mr. L. J. Kettle, city electricity engineer, has reported to the Corporation that the estimated cost of extending electricity supply to the Kilmainham and Inchicore suburban districts would be £45,000.

Glasgow.—Hospital Lighting.—The Health Committee has remitted to a special sub-committee a proposal to install electric lighting at Shieldhall Hospital at a cost of £2,455.

Hawarden.—Application for Order.—The Rural Council has applied for a Special Order to enable it to supply electricity in the parishes of East Saltney, Higher Kinnerton, Hope, Llanfynydd, Sealand, and Tryddyn, and part of the parish of Hawarden, and to authorise the Council to purchase electricity in bulk from the North Wales Power & Traction Co., Ltd.

Inverness.—Proposed Extension of Scheme.—It is proposed that the Corporation shall extend its contemplated electricity supply scheme to include Banffshire, Aberdeenshire, and Moray.

Ilford.—Loans.—Application is to be made to the Electricity Commissioners for sanction to loans of £9,527, to cover excess expenditure, and £10,000 for mains and services.

Leyton.—Loan Sanctioned.—The Urban Council has received sanction to borrow £27,500 in respect of the application for a loan of £34,454 for the erection of the sub-station at Waterloo Road.

London.—Westminster.—The City of Westminster has recently installed about 1,000 new "Revo" lighting fittings in the streets, the fittings being of a new type specially made for this particular installation by the Cable Accessories Co., Ltd.

Maesteg.—Application for Order.—The Council is applying to the Electricity Commissioners for an order authorising the Council to establish an electricity supply undertaking.

Mid-Lancashire.—Electricity Scheme.—The joint scheme of Blackburn and Preston for dealing with the electricity supply in Mid-Lancashire has been definitely prepared for consideration by the Electricity Commissioners. The area extends from Fleetwood to the industrial area of East Lancashire, capital power stations being planned at Blackburn, Preston, Burnley, and Rawtenstall, with "peak load" stations at Blackburn, Burnley, Accrington, and Nelson, and distributing stations at Fleetwood and St. Annes. The initial scheme is to link up the stations at Preston, Blackburn, and Burnley through Accrington, the cables to be laid before 1926, after which year the extensions in other towns will be carried out. The controlling body will consist of representatives of the local authorities concerned. With the exception of Blackburn, present supplies will be available for stations constructed 20 or 30 years ago. Most of the sites, however, are not favourable for cheap generation. The scheme provides that during the years 1922-31 existing stations, with the exception of Blackburn and Rawtenstall, should be gradually closed down, and normal supplies be forthcoming from the larger stations at Blackburn, Preston, and Burnley, all inter-connected with each other. Several of the other stations may be retained for emergency purposes for a time. The Blackburn station is equipped with 20,000 kW, to be extended to 30,000 kW; Preston will have 20,000 kW, to be extended to 40,000 kW; and Burnley will have a capacity of 20,000 kW, to be extended to 30,000 kW. It is proposed that Preston should be in a position to give a supply not later than 1924. The annual saving as a result of the project is estimated at £95,622.

Morecambe.—Loan Sanctioned.—The Town Council has received sanction to a loan of £3,110 for electric lighting work at the Promenade.

Newton Abbot.—Application for Extension of Time.—Application is being made to the Electricity Commissioners for an extension of time under the Act of 1915 for the purchase of the local electricity undertaking.

North Berwick.—Purchase of Electricity Undertaking.—The Town Council has under consideration a proposal to purchase the local electricity undertaking.

Ogmore and Garw.—Electricity Supply.—The U.D.C. is applying to the Electricity Commissioners for a special order authorising the Council to provide and distribute electric energy and to purchase a supply of electricity from the South Wales Electrical Power Distribution Co., Ltd., Messrs. Corv Bros. & Co., Ltd., and the Ogmore Valley Electric Light and Power Co., Ltd., or any other company, &c., producing or generating electricity.

Price Reductions.—Reductions are to be made in the charges for electricity in the following districts: Barking, Battersea, Blackpool, Bootle, Glasgow, Horsham, Ilford, and Maidstone.

Reigate.—New Plant.—In order to meet the increased demand for electricity, the Corporation is installing new plant at an estimated cost of £48,100.

Sidmouth.—Loan.—The Urban District Council has decided to apply for sanction to borrow £12,000 for plant, &c., in connection with the electric lighting scheme.

Salford.—Proposed Large Station.—A special committee of the Corporation met on Monday to consider the question of the proposed large station at Agecroft, and certain suggestions of the Electricity Committee, including the retention of Mr. J. A. Robertson as consulting engineer. An alternative put forward by the Lancashire Electric Power Co. that Salford should stay its hand in the possibility of being supplied by Manchester from its new station at Barton, when it was completed, was rejected. A special meeting of the Council is likely to be called to deal with the situation.

Truro.—Electricity in Bulk.—The Town Council has received approval from the Electricity Commissioners of a scheme for obtaining a supply of electricity in bulk from the Cornwall Electric Power Co., as an alternative to the Council's erecting its own generating station. Arrangements are being made for the supply.

Workington.—Electricity Supply.—The Workington Electric Power Co., Ltd., has been formed to supply the district with electricity. The power station is being erected near the Siddick Colliery, which will be the first place to receive a supply.

Worthing.—Extension of Supply.—The Corporation is promoting a Parliamentary Bill in which authority is sought to extend its area of supply to Durrington.

Warminster.—Electricity Scheme.—The newly-formed Electric Light Co. has decided to erect a power station on a site near the Market Place, and it is hoped to have a supply of electricity available by Christmas.

York.—Loan.—The Town Council has decided to apply for a loan of £4,400 for the extension of the sub-station at Wellington Row. Mains extensions involving an estimated expenditure of £6,350 are to be carried out during the year.

TRAMWAY AND RAILWAY NOTES.

Burnley.—Track Renewals.—The Tramways Committee proposes to relay the track in certain districts, including sections on the Rosegrove, Manchester Road, and Towneley routes, while a double line is to be laid between Rosehill Road and Carr Road.

Cardiff.—Loan.—It was reported at a meeting of the Tramways Committee that £301,000 had been expended on track reconstruction, and as the fund set apart for the purpose had been absorbed it was recommended that application be made for a loan of £160,000 to complete the work.

Proposed Fare Reduction.—The tramway manager has been instructed to prepare a report on the proposed re-introduction of 1d. fares (the present minimum is 1½d.) and on the introduction of special fares for children.

Continental.—France.—It is estimated that the expenditure on the electrification of a length of 1,860 miles of the Orleans railway will exceed 470,000,000 fr. on the pre-war basis of prices, of which 150,000,000 fr. would be for locomotives.

Sweden.—The conversion of the International Swedish Riksgräns-Narvik Railway, which has been twelve years under construction, is approaching completion. The continuation to Narvik is expected to be completed by October this year, when the scheme in its entirety will be finished.

Edinburgh.—New Cars.—Car bodies for the Corporation's new electric cars are under construction by Messrs. P. McHardy & Elliott, Edinburgh.

Leeds.—Extension of Time.—The Minister of Transport has extended the time until August, 1923, of the Leeds Corporation Act, 1914, for the completion of certain tramways.

Halifax.—Track Renewals.—The Tramways Committee has recommended to the Town Council that an additional tramway loop line be constructed at Long Lover Lane, Spring Hall Lane, at a cost of about £500. The committee has also authorised the tramway manager to repair the track at Bradford Road, Bailiffe Bridge, at an estimated cost of £2,000.

Newcastle-on-Tyne.—Inquiry.—An inquiry was held in Newcastle-on-Tyne, at the instance of the Ministry of Transport, on March 31st, as to the expediency of granting an application by the City Corporation to amend the Newcastle Corporation Light Railway Order by including an additional railway. It was stated that the application was for consent to make an addition to the Gosforth Light Railway. The line of the new proposed light railway was situate near the western boundary of the City, and when constructed it would, in conjunction with Tramroad No. 2, now in course of construction, form a means of communication with the centre of the city. The length was six furlongs and the estimated cost of the permanent way was £7,650. The total cost of construction and acquisition of land and buildings was £13,564.

TELEGRAPH AND TELEPHONE NOTES.

Australia. — Trunk Telephones. — The *Sydney Morning Herald* states that the duplication of the telephone trunk line between Sydney and Melbourne has been completed. A duplex telegraph circuit has been superimposed upon each of the circuit wires. The length of the new cable is 580 miles, and it has cost about £36,000.

Italy.—Communication with France.—As the outcome of negotiations between the Governments of France and Italy it has been decided to open up a new telephone line between the two countries by linking the Susa office with that of Modana, making use of the existing French connection between Tunel del Fréjus and Modana.

Switzerland.—Lausanne.—A loud-speaking wireless telephone installation has just been completed at Lausanne which will be in communication with the Eiffel Tower telephone each day between five and six in the evening. It will be able to record communications from London, Berlin, and even America, while aeroplanes on the London-Paris-Lausanne services will be able to maintain constant communication with the new station.—*Reuter.*

The Telephone Service.—New London Exchange.—The "Maryland" Exchange, designed to replace the Stratford and Broadway Exchanges, was opened on April 1st. The switchboards and auxiliary apparatus of all kinds are of the most up-to-date central battery type. The equipment includes electric lamp signals and other labour-saving devices. At the opening, accommodation will be provided for approximately 2,000 subscribers and 460 junctions to other exchanges in London. Ample external cable plant exists in the neighbourhood, and the "Maryland" exchange will be capable of extension to meet the needs of the district for a number of years ahead. The exchange has taken nearly eighteen months to build and equip. The "Maryland" exchange is the twelfth new exchange to be opened in London since the Armistice.

"Fixed-time" Call System.—Arrangements have been made to enable telephone subscribers to book trunk calls in advance. The calls, which will be effected at or about a specified hour, as desired by the subscriber, will be known as "fixed time" calls, and the booking may be either for a single call, which can be given in by telephone or in writing, or for a daily call for a minimum period of a week, including or excluding Saturdays and Sundays, according to the subscriber's wish, under a standing order to be given in writing. The call will be regarded as effective if connection is made within ten minutes after the time for which it is booked. A single "fixed-time" call should be booked at least three hours before the time at which it is required, and the subscriber should ask for "Trunks" or "Toll," as for an ordinary call. Every effort will be made to complete a "fixed-time" call at or about the time desired, but in the event of inadequate notice being given to the department there may be a risk of failure to obtain the connection at the appointed hour. A "fixed-time" call may be of either three or six minutes' duration, but will not be extended beyond a period of six minutes if there are other calls awaiting completion.

Uruguay.—Flores Island.—A portable radiographic installation has been erected on Flores Island to replace the submarine telegraph hitherto connecting it with the mainland.—*Review of the River Plate.*

CONTRACTS OPEN AND CLOSED.

(The date given in parentheses at the end of the paragraph indicates the issue of the Electrical Review *in which the "Official Notice" appeared.)*

OPEN.

Argentina.—Buenos Aires.—June 28th. Municipal Council. Plant for hydro-electric generating station and transformer sub-station.*

Ashton-under-Lyne.—April 12th. Electricity Department. Eight 6,600-V equipments. (March 24th.)

Australia.—Melbourne.—May 11th. Victorian Electricity Commissioners. 960 miles of aluminium steel-cored cable; 3,000 lb. flat armoured wire; 4,000 lb. No. 4 tie wire.—*Reuter's Trade Service* (Melbourne).

May 23rd. Porous cells, &c.*

Perth, W.A.—May 24th. Postmaster-General's Department. Telegraph and telephone accessories.*

July 5th. Victorian Railways. One 2-ton storage battery truck with jib crane and lifting magnet.—*Reuter's Trade Service* (Melbourne).

May 31st. Victorian Railways. Two double-wheel lathes with motor and control gear.*

Tasmania.—June 23rd. P.M.G.'s Department, Hobart. Telephone and telegraph instrument parts. (See this issue.)

Belgium.—April 12th. Belgian State Railways. Supply of 307 tons of copper wire.

May 10th. Belgian Government Light Railways. Supply and laying of armoured cables for tramway lines north of Antwerp.

Brighton.—May 8th. Electricity Department. One 6,000-kW turbo-alternator and exciter with condenser, and one geared turbo-driven d.c. generating plant. (See this issue.)

Bury.—April 15th. Electricity Department. 1,000 yd. of cast-iron pipes, 3 ft. 6 in. internal diameter, construction of intake chamber, and all contingent works between Tottington railway bridge and power station, Chamber Hall. Mr. J. Amsworth Settle, borough engineer.

Douglas (Isle of Man).—April 10th. Corporation. Six miles l.p., three-core, lead-covered cable, distribution pillars, service material, meters, &c. (March 24th.)

May 8th. Corporation. Engine-house plant, including 10-ton travelling crane, two oil engines, complete with oil storage tank, cooler piping, two 210-kW d.c. generators and balancer booster set; main switchboard wiring and connections, storage battery and connections. (See this issue.)

Dundee.—April 20th. Electricity Department. One 12-panel d.c. switchboard, four 3,000-amp. d.c. circuit-breaker panels, and three starting panels for rotaries. (March 24th.)

Falmouth.—Trustees of the Wesley Church. Designs and estimates for electric lighting installation. (March 31st.)

Glasgow.—May 1st. Electricity Department. Cables, meters, and carbons, for 12 months. (See this issue.)

Gravesend.—April 12th. Corporation. Wiring 58 houses, for the T.C. Borough electrical engineer.

Hornsey.—April 20th. Electricity Department. One cooling tower. (March 31st.)

London.—Wandsworth.—April 12th. Board of Guardians. Installation of electric lighting and fire alarms at the Swaffield Road Schools. (March 24th.)

Stepney.—April 20th. Electricity Supply Department. Three 1,000-kW converting sets and one 50-ton electrically-driven overhead gantry crane. (March 31st.)

H.M. Office of Works.—May 4th. Engineering labour (electrical, &c.) required in the district during a period of three years. Secretary, H.M. Office of Works (Contracts Branch), King Charles Street, London, S.W.1.

Metropolitan Asylums Board.—April 26th. Installation of two electric automatic passenger lifts and two electric automatic service lifts at Tooting Bec Mental Hospital, &c. (See this issue.)

Loughborough.—April 14th. Electricity Department. E.h.p. switchgear, and extensions to d.c. switchgear. (March 24th.)

Manchester.—April 13th. Electricity Committee. 16-ton overhead travelling crane (hand operated). Mr. F. E. Hughes, secretary Electricity Department, Town Hall, Manchester.

New Zealand.—Wellington.—July 8th. Public Works Department. Eight steel transmission line towers.—*Reuter's Trade Service* (Melbourne).

Rhondda.—April 12th. U.D.C. Wiring and fixtures for 42 houses at Penygraig. Specifications (21s.) from the manager, Electricity Works, Porth.

South Africa.—Krugersdorp.—April 24th. Municipal Council. According to information received by the D.O.T. in London, tenders are invited for work and materials for the conversion of the d.c. electric lighting system at Krugersdorp to a.c., viz., a.c. transformers, voltage regulators, cables, overhead transmission lines, switchgear, l.p. feeders and distributors, motors and meters. Alternate tenders are invited for the completion of the whole scheme and for taking over the electrical plant at present in the Pretoria Street power station. Time required to supply material or to complete work to be stated. Particulars from the Town Engineer or the Consulting Engineer, Prof. W. Buchanan, 75, Louis Botha Avenue, Houghton Estate, Johannesburg.

Walthamstow. — April 12th. Electricity Department. E.h.p. feeder cable and l.p. distributor and public lighting cables. (March 24th.)

Warrington.—April 18th. Electricity Department. H. and l.p. paper and lead-covered cable. (March 31st.)

April 18th. Electricity and Tramways Committee. Tramway pole-planting wagon. Mr. F. V. L. Matthias, borough electrical and tramway engineer, Electricity Works, Warrington.

Wolverhampton. — April 12th. Board of Guardians. Electric lighting installation at the Institution, Heath Town. (March 24th.)

*A copy of the plan, specifications, and conditions of tender, &c., can be inspected at the Department of Overseas Trade (Room 84), 35, Old Queen Street, S.W.1.

CLOSED.

Australia.—Melbourne.—Victorian Railways. Accepted:—

One 50-ton overhead travelling crane (£2,225).—Herbert Morris, Ltd.

Static transformers:—Section A.—Item 1, indoor 3-phase, &c., £1,337 each; item 2, £560 each; item 3, indoor single-phase, &c., £200 each. Section B.—Item 1, outdoor 3-phase with terminal boxes, &c., £721 each; item 2, ditto, £1,202 each; item 3, indoor single phase, &c., £154 each; item 4, two additional 3-phase units, £7,240 each.—Johnson and Phillips, Ltd.

Benalla, Victoria, Shire Council has accepted the following in connection with the installation of an electric plant:—

Power plant (£6,400).—Wm. Adams & Co.
Bare copper cable (£1,300).—Homewood & O'Neil Pty., Ltd.
Insulated cable.—W. T. Henley's Telegraph Works Co., Ltd.
Switchboard (£400).—T. Houlton & Co.
Alternators (£1,250).—Thomas Bros.
Meters (£630).—Australian General Electric Co.
Insulators.—British General Electric Co., Ltd.
Fuses.—Lawrence Hanson Electrical Co., Ltd.
Street lighting fittings (£125).—Edison Swan Electric Co., Ltd.
Lightning arresters.—Noyes Bros.

Commonwealth Postmaster-General's Department for South Australia:—

20 tons h.d. copper wire, 100 lb. per mile (£2,700).—British Insulated and Helsby Cables, Ltd.

Victorian State Rivers and Water Supply:—

Induction motors and transformers, for the Red Cliffs pumping plant (£2,095).—Weymouths, Ltd.

Victorian Public Works Department:—

Watt-hour meters and maximum demand indicators (£837).—Australian General Electric Co.—*Tenders.*

Belgium.—From a Belgian correspondent we learn that the following tenders were among those received by the St. Gilles Corporation for the supply of 14,700 metres armoured cable and 4,000 kg. bare copper wire:—

Soc An. Nederlandsch Kabelfabriek à Delft. (Hollande), 174,965 fr.
Manufacture de câbles électriques en caoutchouc d'Eupen, 177,607 fr.
Ateliers de constructions électriques de Charleroi, 184,399.50 fr.
J. Corvilain, Saint Gilles, 203,187 fr.
Soc. Italiana Conduttori Elettrici, Leghorn, 245,380 fr.

We understand that tenders were received from three Belgian, one Dutch, one Czecho-Slovakian, two Italian, and four French concerns.

The Belgian Post Office received tenders as follows for the laying-in, jointing and delivery of 12,853 metres lead covered, 3,165 metres armoured, and 119 metres rubber, telephone cable in Antwerp:—

The Electric Cable & Conduit Co. (Mr. Janssens), 620,969.65 fr.
Cableries de Presbourg, 622,639.43 fr.
A.C.E.C., Charleroi, 747,693.77 fr.

Chippenham.—Town Council. Accepted:—

Installing electric lighting in the Council houses.—Mr. A. R. Fox.

Dundee.—The Corporation Electricity Committee has accepted an offer by a Berlin firm for the supply of cables. The lowest British offer was £851, but it was reported that the German firm was prepared to offer cable of the same quality at least 10 per cent. cheaper. Replying to a member, who moved that the British offer be accepted, Mr. H. Richardson, the engineer, pointed out that it only meant a saving of £80 or £90 in this case, whereas if they let it go out that they were shutting the door to Continental tenderers it would mean the payment of scores of thousands more in the future than would otherwise be the case. The German offer was accepted.

Edinburgh.—The Tramway Committee has, by a majority, recommended the acceptance of a German (Cologne) manufacturer's tender for 130 tons tramway rails and 5 tons fish plates; also another German firm's tender for steel poles. The different prices were:—

Rails:—German tender, £1,365; British tender, £1,495.
Poles:—German (Dusseldorf), £5,436; British, £7,977.

Glasgow.—Housing Committee. The Corporation has received a letter from the Scottish Board of Health approving of the tender of Mr. R. J. Sinclair, Glasgow, for electric lighting of the Council's houses at Mosspark, but suggesting that acceptance should now be given for 500 houses in place of the 750 recommended. The Committee on Housing has agreed to the restriction.

Corporation. Electricity Committee. Recommended:—

Four Penstock sluice valves in connection with the second inlet culvert at the Dalmarnock power station (£1,320).—Ham, Baker & Co.

Electricity Committee. Accepted:—

Circulating water pipes and foundations (£11,012).—Yorkshire Hennebique Co., Ltd.
Converting plant (£16,927), switchgear (£1,414).—British Thomson-Houston Co., Ltd.
Electrical work at Glasgow Municipal buildings extension (accepted).—Johnston, Park & Co.

Tramways Committee. Recommended:—

V.I.R. cable.—Western Electric Co., Ltd.

Kettering.—U.D.C. Accepted:—

Feeder cables.—Union Cable Co., Dagenham Dock.

North Woolwich.—Messrs. Harland & Wolff, Ltd., have placed orders for electrical equipment (over £32,000) with a Glasgow firm in connection with the new site at North Woolwich yard. This includes two 3-motor 20-ton cranes, five 3-motor 10-ton cranes, one 4-motor overhead travelling crane, four 3-motor 3-ton slewing mono-rail cranes, and the necessary runs of longitudinal conductor. The two 20-tonners will cost £5,537; the five 10-tonners, £11,792; the four-motor overhead 10-tonner, £4,200; and the four three-motor slewing cranes, £7,224.

Salford.—Education Committee. Accepted:—

Electric wiring and supplying lamps at Hankinson Street school.—Power and Lighting Supplies Co., Ltd.

Tramways Committee. Stores for six months. Accepted:—

Armature coils.—P. R. Jackson & Co., Ltd.
Field and armature coils.—Barrett & Thornton.
Lamps and dry cells.—English Electric & Siemens Supplies, Ltd.; British Insulated & Helsby Cables, Ltd.
Carbon brushes.—J. Bates.

FORTHCOMING EVENTS.

Royal Institution of Great Britain.—Saturday, April 8th. At Albemarle Street, W. At 3 p.m. Lecture on "Radio-activity," by Sir Ernest Rutherford, F.R.S.

Birmingham and District Electric Club.—Saturday, April 8th. At 7. At the Grand Hotel, Colmore Row. Paper, "Notes on Marine Salvage," by Mr. V. H. Pearson.

Salford Technical and Engineering Association.—Saturday, April 8th. At the Royal Technical College. At 7 p.m. Lecture on "Steam Turbines," by Mr. G. G. Stoney.

Chief Technical Assistants' Association.—Saturday, April 8th. At the Engineers' Club, Coventry Street, W. At 7 p.m. Annual dinner.

Institution of Electrical Engineers (North-Eastern Centre).—Monday, April 10th. At Armstrong College, Newcastle-on-Tyne. At 7.15. Annual general meeting.

(North-Western Centre).—Tuesday, April 11th. At the Engineers' Club, Manchester. At 7 p.m. Informal meeting, discussion on "High-power Mercury Arc Rectifiers," to be opened by Mr. R. L. Morrison.

(Scottish Centre).—Tuesday, April 11th. At 20, Bath Street, Glasgow. At 7.30 p.m. Paper on "Rotary Converters," by Mr. F. P. Whitaker. Annual general meeting.

Societe des Ingenieurs Civils de France.—Tuesday, April 11th. At the Institution of Mechanical Engineers, Storey's Gate, S.W. At 5.30 p.m. Presidential address, "Co-operation between Engineering Institutions in France and Great Britain," by Mr. W. Noble Twelvetrees.

National Association of Supervising Electricians.—Tuesday, April 11th. At St. Bride's Institute, Bride Lane, E.C. Lecture on "Temporary Expedients," by Mr. W. E. Highfield.

Association of Engineers-in-Charge.—Wednesday, April 12th. At St. Bride's Institute, Bride Lane, E.C. Paper on "The Artesian Wells and Geological Strata of London," by Mr. R. Langton Cole.

THE "ELECTRICAL REVIEW" SERVICE DEPARTMENT.

To enable us to complete replies to queries received this week we need the names of suppliers or manufacturers of:—

Rely-a-Bell Burglar Alarms.

NOTES.

The Lock-out.—The forty-seven trade unions having accepted the memorandum of April 1st as a basis of negotiations regarding managerial rights, the lock-out notices relating to them were suspended on Wednesday, and negotiations between the Employers' Federation and the Negotiating Committee of the Unions will begin on Monday. In the House of Commons on Wednesday, Dr. Macnamara, Minister of Labour, said he could see no justification for instituting a Court of Inquiry under Part II of the Industrial Courts Act in respect of a matter conjointly affecting four groups of unions, three having found it possible to resume negotiations with the employers and the fourth not.

Invitation to The Trade to Exhibit at Hanley.—Firms willing to co-operate with the Potteries Branch of the Electrical Contractors' Association in making a good exhibit of electrical manufactures for domestic and similar service, at the Ideal Homes Exhibition, to be held at Hanley, from May 4th to 20th, are asked to communicate with the Secretary of the Branch, Mr. A. Gould, c/o Messrs. Barnett & Sons, 34, Church Street, Stoke-on-Trent.

Co-Partnership in Industry.—Lord Robert Cecil occupied the chair at a luncheon given by the Labour Co-Partnership Association on March 29th, and the chief guests were Lord Leverhulme and Mr. D. Milne Watson. The chairman said that the history of industrial matters during the past few months pointed to the necessity for a change in the organisation of industry. Men and women of ability on both sides were ranged against one another when, if they would combine, they might improve the prosperity of industry and the nation. Lord Leverhulme said that the firms with which he was connected had weathered the storm mainly through co-partnership. Co-partnership was not a short cut to increased profits, and anyone who approached it from that angle was likely to be disappointed. Mr. Milne Watson described the scheme being worked by the Gas Light and Coke Co.

Editors' Difficulties.—The *Journal* of the British Chamber of Commerce of Turkey and the Balkan States, in apologising for an error, states that there are many difficulties in editing a journal at a distance of 3,000 miles from the printer, and that this functionary invariably gets his own way. We are not so far separated from our printer, but even so we occasionally have to make apologies for mistakes. Our readers will notice that these are usually (and truthfully) described as "printer's errors," proving that difficulties do not always decrease with the distance.

The Batti-Wallahs' Society.—The eleventh annual dinner of the Society took place on March 31st; Mr. Edgar S. Barnlet, the President, occupied the chair. After an excellent dinner a concert, interspersed with toasts, was given. Mr. E. G. Batt sang "The Batti-Wallahs' Song," by Mr. F. J. Collis, and other items were rendered by Miss Elsa Cameron and Messrs. Alfred Ricardo, Leonard Underwood, Wilkin, and McGowan. The toast list included "The Society" and "The Ladies and Visitors."

An Industrial Organisation.—At the London School of Economics on March 24th Mr. Hugo Hirst (chairman of the General Electric Co., Ltd.) delivered an address on "The Characteristics of a Great Industrial Organisation." Mr. Hirst said that he considered the definition of "Industry" to be the combination of brain, labour, and capital to create values from raw materials. As his audience consisted mainly of civil servants, he explained the difference between governmental organisation and that of a money-making business. He said that while the aim of a business firm was to obtain results, which could be measured, in a limited period, a Government department was framed to last for generations, and its benefits could not be estimated in terms of money. A Government department possessed dictatorial powers, but in business supplier and purchaser were equal. Civil servants, unlike men in business, had to be self-effacing, and consequently some of the best men in the country were suffocated by routine. Turning to the organisation of his company, Mr. Hirst said that experience had taught them that the only safe basis of organisation was not system, but the human factor that controlled it. This meant the selection of men for the chief positions who thoroughly understood the wishes of the heads of the concern. Men were selected and assisted in every possible way to further the success of their departments, and they were given power equal to that of ownership. Except the annual audit, there was no control which would lower them in the eyes of their subordinates, and although he would not say that everyone had been successful, he did not know of a single case in which this confidence had been misplaced. These managers were allowed certain sums of money for their use, but all capital expenditure had to receive the sanction of the head office, and all money from sales went through to the head office. In studying managers' balance-sheets, the speaker said that profits were not the only indication of the success of a branch. He studied the balance-sheet to see if the sales were a reasonable proportion of the possible sales in the district, and also if the stock was in the right proportion to sales. Another point dealt with was the ratio of expenses to sales, and in this many complicating points arose, such as the fluctuation of the cost of materials, &c. The "captain of industry" had a difficult task. He could not possibly know all the details of his business, but he must be a man of high integrity and education to be able to understand all the scientific, technical, and commercial problems which were put before him for decision. Research, development, production, sales, and distribution must be correctly co-ordinated in his programme. He must also be conversant with the political and economic conditions of many countries. As an example of the work of a captain of industry, Mr. Hirst outlined the history of the G.E.C. lamp works, with all its risks and final success. He concluded by pointing out that no municipal or Government authority would dare to take the risks a business man must take to succeed.

Smoke Abatement.—The Coal Smoke Abatement Society recently organised a deputation to meet Sir Alfred Mond, Minister of Health, consisting of influential representatives of many widely-different interests. Sir Aston Webb spoke of the deleterious effect of smoke upon buildings and works of art. He considered that domestic ranges should be abandoned.—Mr. Thomas Paxton, Lord Provost of Glasgow, said that much had been accomplished in his city by lectures and demonstrations. In the city's Act not only was "black" smoke prohibited, but the Corporation had powers to prosecute in other cases.—Mr. Andrew Taylor, L.C.C., considered that the word "black" should be deleted from the Act of Parliament concerning smoke nuisance; yellow smoke contained more objectionable chemical compounds.—Sir W. Napier Shaw (Royal Meteorological Society) said that in residential London domestic smoke was responsible for two-thirds of the atmospheric pollution. Lord Newton's Committee dealt only with the industrial side of the smoke nuisance problem, but if legislation was to be of any use it must deal with the domestic aspect as well.

Sir Alfred Mond, in reply, said that he was very interested in the subject. He thought that local authorities might do much more to mitigate the nuisance. If domestic heating by other forms could only be made sufficiently cheap they would soon replace raw coal, but he doubted if anything could be done in the way of legislation abolishing the open hearth. Propaganda could effect a great deal, and upon the advice of Lord Newton's Committee the Ministry of Health had assigned to competent officers the task of advising and assisting manufacturers and local authorities.

Dundee Electricity Department.—High praise is meted out to the organisation of the Dundee Corporation Electricity Department by the Visiting Committee of the Dundee Town Council, which has been making exhaustive inquiries into the working of the various municipal departments. A report issued on the Electricity Department ends as follows: "The committee was much impressed by the whole organisation, evidently giving the engineer an oversight and grip throughout and yet without the useless redundancies of organisation that are in some modern systems. They were also very pleased to observe the good spirit and the conspicuous interest in their work shown by the staff throughout. They spoke as if they and the undertaking were one. The custom observed of having a monthly meeting of the staff for discussion of methods and suggestions for improvements is typical."

Late Parliamentary Notes.—Electricity Supply Bill.—The House of Lords resumed on Wednesday the consideration of the Electricity (Supply) Bill in Committee. On Clause 10 (power to continue wayleaves), Viscount Peel moved amendments designed to reserve to the railway companies the protection afforded to them under the Act of 1919. These were agreed to.

Lord Monkbreton moved a new clause to follow Clause 11 (power to make agreements as to the erecting of generating stations), providing that the Electricity Commissioners might by Order suspend for such period as they thought fit the purchase by a joint electricity authority or the L.C.C. or any local authority in the case of any transfer of lease to a joint electricity authority of any part of an authorised undertaker's undertakings, provided that consent to such suspension has been previously obtained. This new clause was agreed to.

The Committee stage of the Bill was concluded without further amendment, and the Bill, as amended, was reported to the House. The Earl of Crawford stated that the report stage would be taken on Tuesday, April 11th.

Special Orders Approved.—Both Houses of Parliament on Wednesday approved the Special Orders made by the Electricity Commissioners under the Electricity (Supply) Acts, 1882 to 1919, and confirmed by the Minister of Transport under the Electricity (Supply) Act, 1919, in respect of the following: The urban district of Amble, Northumberland, the parish of Distington, Whitehaven, Cumberland (both presented on February 27th); the urban district of Ammanford, Carmarthen, the borough of Wareham and parts of the parishes of Arne and Wareham St. Martin, in the rural district of Wareham and Purbeck, Dorset (all presented on March 13th); and the urban districts of Great Harwood and Rishton and the parishes of Wilpshire, Clayton-le-Dale and Ramsgreave, in the rural district of Blackburn, Lancs. (presented March 14th).

Motor Head Lights.—The Council of the Optical Society is arranging a programme of papers dealing with motor head lights, having reference, more particularly, to the optical problems involved. The question of "glare" or "dazzle," and the methods proposed for overcoming it will be considered, from the points of view of the optician, the lamp manufacturer, and the road user. The meeting will be held at the Imperial College of Science and Technology, South Kensington, on May 11th next, and anyone desiring to contribute to the discussion or to exhibit models, or give experimental demonstrations is requested to communicate with the honorary secretary of the Society, Mr. F. F. S. Bryson, Glass Research Association, 50, Bedford Square, W.C.1.

X-rays and Cancer.—The Medical Correspondent of *The Times* reports that good results have been obtained in the treatment of cancerous growths by X-rays at the West London Hospital. Of over 200 cases, many were considered incurable, but only ten patients have died after the lapse of a year. It is not yet known whether the "cures" are permanent, and it is not suggested that benefit is likely to occur in every case. The results so far obtained certainly warrant the continuance and expansion of the work.

The League of Nations Technical Commission.—The Consultative and Technical Commission for Communications and Transit, constituted at the wish of the last Assembly of the League of Nations, is meeting in Geneva. The Commission has to prepare a general convention concerning the international *régime* of railways, and questions relating to internal navigation, air and road transport, transfer of water power or electricity from one country to another, are on the agenda.—*The Times.*

Mining Dangers Research Board.—The Secretary for Mines has appointed the following sub-committee of the above Board to deal with Technical Appliances:—Col. W. C. Blackett, C.B.E. (chairman); the Rt. Hon. W. Brace, P.C., M.P.; Mr. C. P. Sparks, C.B.E.; Dr. R. V. Wheeler, F.I.C.; Mr. C. D. Mottram, B.Sc. (secretary). Mr. Mottram's addresses are the County Hotel, Newcastle-on-Tyne; and Mines Department, 46, Victoria Street, S.W.1.—*Board of Trade Journal.*

Vulcanising Rubber with the Electric Oven.—An American brush company has adopted electricity instead of steam for vulcanising rubber brushes. An oven measuring 53 in. deep, 28 in. wide, and 35 in. high is used, with electric heating elements at the bottom. Automatic temperature controllers are employed. According to the *Electrical World*, the result is a reduction in the cost of vulcanising.

Water Power in the United States.—As the result of investigations made by the U.S. Geological Survey, it is stated that the capacity of turbines installed of more than 100 h.p. amounts to 7,852,948 h.p., distributed amongst 3,116 installations. The potential water-powers of the United States amount to a minimum of 27,943,000, with a maximum value almost exactly double.

The Felten and Guilleaume Group.—It is stated that the Felten and Guilleaume Co. of Cologne-Mulheim, which formerly lost control over the Austrian Felten and Guilleaume works when the latter was converted into a joint stock company, has now regained a decisive influence in the latter through the acquisition of a considerable number of shares. The Austrian company holds the majority of the shares in the Buda-Pesth company bearing the same name.

Appointment Vacant.—Telephone line foreman (£250), for the Government of British Guiana Post Office Department. (See "Official Notices" to-day.)

The Electrical Power Engineers' Association (London Western Section).—On Saturday last a dinner was held by the London Western Section at the Holborn Restaurant. The chairman of the Section, Mr. W. J. Oswald, presided over an attendance which, as he remarked, suffered from the coincidence with Boat-Race Day. Ladies were present, and a very excellent musical entertainment was provided, Mr. Tom Kinniburgh's songs and those of Miss Vera Mills being particularly appreciated. After the loyal toast had been duly honoured, Mr. W. J. Jeffery, president of the Association, proposed "The Section," which, he had heard, embodied the brains of the E.P.E.A. (a claim made also for each of the other Sections); its chairman was his senior lieutenant this year. Mr. Oswald, in responding, explained that he had resigned the post of chairman in accordance with the rules, but the Section refused to accept his resignation. The aim of the Association was not merely to improve salaries, but to uplift the profession of power engineer and to benefit the whole of the electricity supply industry. The efficient training of engineers was now their main concern, for they must have the most competent men in what he claimed to be the premier profession; it was a problem of vital importance. A lock-out was unfortunately in progress, but the power engineers were determined that the electricity supply industry should not be dragged into the conflict. Mr. A. F. Harmer proposed "The Visitors, the Ladies, and the Press," drawing special attention to the valuable work of Mr. Pooley on the I.E.E. Informal Meetings Committee, Mr. Whitgift as "informal" reporter, and Mr. W. A. Jones as secretary of the Association. Mr. A. Gay, responding, advocated closer relationship between the senior and junior officers in the supply industry, and Mr. A. H. Allen also responding paid a tribute to the high ideals of the Association and the excellent qualities of its leaders.

Mr. J. H. Parker proposed the health of the Chairman—a man in a thousand—which was accorded musical honours. Mr. Oswald, in reply, emphasised the duty of everyone to help on the work of the world, and at a later stage expressed the indebtedness of the company to the hon. secretary, Mr. W. Cornet, and Mr. Harmer for the admirable entertainment which they had organised.

Annealing Steel by Electricity.—By using the electric furnace, a Buffalo company has annealed thousands of tons of steel wire without a single rejection, using only 115 kWh per ton. The wire was ¾ in. in diameter, and was passed through the furnace in charges of 7,500 lb. Heat was economised by placing the cold charge alongside of the cooling charge for three hours in a preheating chamber, after which it was placed for three hours in a chamber heated to 1,360 deg. F. The labour involved was that of two men for seven minutes once in three hours. Working ten hours a day, the furnace turns out a ton of annealed wire with a consumption of 185 kWh; on continuous 24-hour operation the consumption is reduced to 115 kWh. The product is superior to that of a furnace heated with fuel, and is less oxidised. The annealing is perfectly uniform, greatly facilitating subsequent operations. The heating elements are of heavy nickel-chromium ribbon, suspended on refractory insulators fixed to the side walls of the furnace, with a total rating of 180 kW, and the temperature is controlled by automatic apparatus.—*Electrical World.*

INSTITUTION NOTES.

Institution of Electrical Engineers.—Council's Nominations.—The following have been nominated by the Council for the vacancies which will occur in the offices of president, vice-presidents, honorary treasurer, and ordinary members of Council on September 30th, 1922:—

President.—F. Gill, European Chief Engineer, International Western Electric Co.

Vice-Presidents.—W. H. Eccles, D.Sc., F.R.S., Professor of Electrical Engineering and Applied Physics, City and Guilds Technical College, Finsbury; A. A. Campbell Swinton, F.R.S., consulting engineer, 66, Victoria Street, S.W.1.

Honorary Treasurer.—Sir James Devonshire, K.B.E., director, Underground Electric Railways Co. of London, Ltd.

Ordinary Members of Council.—Members (three vacancies).—J. W. Beauchamp, director and secretary, British Electrical Development Association; A. C. Cramb, engineer and manager, Borough Electricity Works, Croydon; Major K. Edgcumbe, L.E.E., joint managing director, Messrs. Everett, Edgcumbe & Co., Ltd.; C. C. Garrard, Ph.D., manager, switch and controller department, General Electric Co., Ltd.; W. M. Selvey, consulting engineer.

Associate Members (three vacancies).—F. W. Crawter, London manager, Chloride Electrical Storage Co., Ltd.; A. B. Hart, assistant staff engineer, Engineer-in-Chief's Office, General Post Office; W. B. Rawlings, joint managing director, Messrs. Rawlings Bros., Ltd.

Associate (one vacancy).—D. N. Dunlop, director, British Electrical and Allied Manufacturers' Association.

Kelvin Lecture.—The 13th Kelvin Lecture will be given by Sir Ernest Rutherford, K.B.E., F.R.S., on "Electricity and Matter," on Thursday, May 18th, at 6 p.m.

Electrical Power Engineers' Association (Southern Division).—A general meeting will be held on Friday evening, April 21st, at the Essex Hall, Strand, W.C., at 7 o'clock. On Friday, April 28th, at the Institution of Electrical Engineers, Victoria Embankment, W.C., at 7 p.m. Mr. C. F. Hewitt will lecture on the "Design of Generating Plant."

Institution of Railway Signal Engineers (Inc.).—A paper entitled "Location of Signals as an Aid to Traffic Working" will be read by Mr. R. S. Proud before this Institution at the Institution of Electrical Engineers at 3 p.m. on Thursday, April 20th.

Royal Institution.—Amongst the lectures to be given after Easter are the following: Friday evening discourses, May 19th, by Sir William Bragg, "The Structure of Organic Crystals"; May 26th, by Prof. W. E. Dalby, "The Internal Combustion Engine: its Influence and its Problems." Day lectures, April 26th and May 6th, Prof. D. H. MacGregor, on "Industrial Relationships"; May 13th and 20th, Prof. O. W. Richardson, "The Disappearing Gap between the X-ray and Ultra-violet Spectra."

Iron and Steel Institute.—The annual meeting of the Institute will be held at the Institution of Civil Engineers on May 4th and 5th. Among the papers to be submitted at the meeting are "Recent Developments in Power Production," by D. Selby-Bigge, and "X-ray Studies on the Crystal Structure of Steel," by A. Westgren and C. Phragmen. The annual dinner is to be held at the Connaught Rooms on the evening of the first day. The date of the autumn meeting, which is to be held in London, has been fixed as September 5th, 6th and 7th.

Société des Ingénieurs Civils de France.—The opening meeting of the British Section for the Session 1922-23 will take place on April 11th at the Institution of Mechanical Engineers. The presidential address will take the form of an opening to a discussion on "Co-operation between Engineering Institutions in France and Great Britain." Members of British engineering societies are invited to attend.

Electrical Society of Glasgow.—On March 21st the first formal meeting of the Society was held, when Mr. P. J. Sims, manager for Scotland of the General Electric Co., Ltd., read a paper on "Organisation."

OUR PERSONAL COLUMN.

The Editors invite electrical engineers, whether connected with the technical or the commercial side of the profession and industry, also electric tramway and railway officials, to keep readers of the Electrical Review *posted as to their movements.*

Mr. Frank Marsh, foundry foreman with Messrs. Curran's Cardiff Foundry and Engineering Co., has been appointed public lighting inspector by the Cardiff Electricity Committee at £350 per annum.

Mr. C. E. Skinner, manager of the Research Department of the Westinghouse Electric and Manufacturing Co., has been appointed assistant director of engineering in that company. His duties will cover research, standards, and other work along these lines.

Mr. B. F. Kerridge, formerly under-surveyor of Messrs. Baldwin's collieries and later H.M. Inspector of Mines at Newport, sailed for India last week to take up an appointment as the first Electrical Inspector under the Mines Department of the Indian Government.

Mr. J. J. C. Bradfield, chief engineer for metropolitan railway construction, N.S.W. railways, was leaving Australia on March 16th for America and Great Britain, where he will be available for consultation by intending tenderers for the erection of the Sydney Harbour bridge. According to *Tenders*, it is expected that 12 firms will tender for the work, four from North America, four from Europe, and four from Great Britain.

There are 69 applicants for the post of sales superintendent in the Edinburgh Corporation Electricity Department at £600 per annum.

Mr. John Bernard, manager of the Bolton Tramways Department, has been elected one of the employers' representatives on the National Joint Industrial Council for the tramways industry in succession to Mr. J. M. McElroy, the retiring manager of Manchester tramways.

Blackpool Tramways and Electricity Committee is to advertise for a successor to Mr. C. I. Baker, the chief traffic superintendent, who has been appointed elsewhere.

It is announced that Sir Frederick Sykes has been appointed a director of the Anglo-Argentine Tramways, Co., Ltd.

Tenders reports that Mr. A. E. Ford, late traffic superintendent, Adelaide Municipal Tramways Trust, has been appointed assistant general manager of the Auckland, N.Z., tramways at £1,000 per annum and allowances.

We regret to learn that, owing to ill-health, Mr. Arthur B. Canning, for a number of years connected with the firm of W. Canning & Co., Ltd., Birmingham, has been compelled to resign his position on the directorate and to definitely retire from business.

Mr. Henry J. Spooner, M.I.Mech.E., A.M.Inst.C.E., &c., head of the Polytechnic School of Engineering, Regent Street, is retiring from that position in July after having held it for 40 years. During that period over 20,000 students have been trained under him, many of whom are at present holding important official administrative and executive positions in all parts of the world. He has been a member of the leading engineering and scientific societies of this country for nearly 40 years, and is also a member of French and American societies, as well as of the International Committee on Industrial Fatigue. The pioneer instructional courses in motor-car and aeronautical engineering in this country were arranged by him, and he is the author of 16 published works on engineering, mechanical science and economics, and of professional papers. These include a standard work on "Machine Design," and a war book, "Wealth from Waste." Mr. Spooner has also been in practice as a consulting engineer since 1884. During the war some 2,000 workers of both sexes went through intensive courses of training under his supervision, and he acted as honorary technical adviser to the King George Hospital, and to the Union of South Africa, in connection with the vocational work at the Military Hospital in Richmond Park. Mr. Spooner received the cordial thanks of the Governor-General and of

Mr. Henry J. Spooner.
Head of the Regent Street Polytechnic School of Engineering.

the High Commissioner of the Union of South Africa for his services. In 1917 he delivered a Chadwick public lecture on "Fatigue and the Worker" at H.M. Munition Works at Gretna, and in April, 1921, he initiated in America the campaign against noise by writing a paper on "Fatigue due to Noise, and Methods of Elimination," and he initiated the movement in this country at Blackburn in November, 1921, when he delivered a Chadwick public lecture on "Problems of Noise and Fatigue." In the year 1895 his services in the cause of science were recognised by H.M. King Alexander of Serbia, who conferred on him the Knight Commandership of the Royal Order of St. Sava, and in the year 1907 H.M. King George of Greece conferred on him the Knighthood of the Golden Cross of the Redeemer. Mr. Spooner has happily not been absent from his work through illness for a single day for 40 years—surely a remarkable record. His retirement is being made the occasion by his past and present students for presenting him with some tangible evidence of their appreciation. Old students who desire to contribute are asked to communicate with Mr. F. R. S. Rice at the Polytechnic, Regent Street, W.1.

Mr. George P. Cosway, managing director of the Nuneaton Electrical Contracting Co., Ltd., has resigned his position with the company, and will shortly open offices in Nuneaton as consulting engineer and manufacturers' agent.

At the Newcastle-on-Tyne City Council meeting last week the Town Clerk read a letter from Mr. Ernest Hatton, tramways manager, who, referring to his resignation tendered in February, said that he had had further advice regarding his health, and had received a more favourable report. After the short rest he had had he was feeling somewhat better, and therefore desired to be allowed to withdraw his resignation. The matter was referred to the Tramways Committee.

Obituary.—Mr. J. N. Paxman.—We regret to record the death, which occurred at Bournemouth on March 29th, of Mr. James Noah Paxman, of Colchester. He was prominently connected with the founding of the firm of Davey, Paxman and Co., and had been twice Mayor of Colchester. *The Times* states that his firm supplied the power and "drove the first public electric light for exhibitions in London, notably at the Crystal Palace and elsewhere," while it also "supplied the lighting power at one of the Paris Exhibitions."

Mr. E. A. Claremont.—We regret to learn that the death took place suddenly on Tuesday morning of Mr. E. A. Claremont, managing director of Messrs. W. T. Glover & Co., Ltd., Trafford Park.

Will.—The late Mr. Hugh Bramwell, chairman of the Treforest Electrical Consumers Co., left £21,466 gross and £15,315 net personalty.

NEW COMPANIES REGISTERED.

Whitehall Electric Investments, Ltd.—Registered on March 30th, by Messrs. Ashurst, Morris, Crisp & Co., with a nominal capital of £6,500,000 in 1,500,000 7½ per cent. cumulative preference and 5,000,000 ordinary shares of £1 each. The preference shares rank first for return of capital in the event of winding up. The objects are: to acquire certain bonds, debentures, and debenture stock comprised in an agreement (not filed) with the Whitehall Securities Corporation, Ltd., to subscribe for, underwrite, acquire, hold, and deal in the shares, stocks and securities of any electrical undertakings, and transport and public utility services, to acquire any licences or concessions for or in connection with the generation, utilisation, distribution and supply of light, heat, sound and power by electricity or otherwise, or with the construction, equipment and control of railways, tramways and electric lighting and power supply works and the carriage of passengers and goods; to supply electricity for all purposes, to carry on business as electrical engineers and contractors, &c. Further preference shares to a nominal amount not exceeding £3,500,000 may be issued to rank, *pari passu*, with the original preference shares, but otherwise no new shares may be issued to rank, *pari passu*, with or in priority to such original preference shares without the sanction of an extraordinary resolution of the holders of such preference shares. The preference shares confer votes only under special circumstances. Subject as above, each share confers one vote. The directors are authorised to borrow up to the nominal amount of the capital, but no specific information is filed at present concerning the £2,500,000 first mortgage debenture stock. The number of directors is not to be less than three nor more than 10. The first are: Hon. Clive Pearson, Sir Clarendon G. Hyde, Vincent W. Yorke, J. H. Macdonald, and A. E. Worswick; no addresses given. Qualification, one share. Remuneration as fixed by the company. Secretary: J. Lister Walsh. The registered office is at 47, Parliament Street, S.W.1. File number 180,780.

Cambrian Electrolytic Zinc Co.—The Cambrian Electrolytic Zinc Co., Ltd., was registered on March 30th with a nominal capital of £50,000 in 185,000 participating preference shares of 5s. each and 75,000 ordinary shares of 1s. each. The objects are: To acquire the undertaking of the Lisburne Development Syndicate, Ltd., and the Welsh Mines Corporation, Ltd., to acquire any mines, oil or mining rights and metalliferous or other land in the United Kingdom or elsewhere, to adopt the process known as the "Electrolytic deposition of zinc," and to carry on the business of miners, preparers for market of ores, metals, precious stones and minerals, &c. The minimum cash subscription is seven shares. The first directors are: Newman Goldman, 96, Ridgemount Gardens, W.C.1; C. S. Quatermaine, Bank Chambers, Dorset Street, W.1; E. A. Wakefield, "Lymhurst," Esher. The registered office is 80, Bishopsgate, E.C.2. The file number is 170,746.

Burndept, Ltd. (180,745).—Private company. Registered March 30th. Capital, £20,000 in £1 shares. To acquire from Burnham and Co., of St. Paul's Wharf, Deptford, S.E.8, the benefit of certain existing inventions relating to wireless telegraphy or telephony, &c. The subscribers (each with one share) are: A. W. Slade, 73, Nichols Square, Hackney Road, E.2, clerk; F. A. Saxon, 2, Newcomen Road, Finchley, N., clerk. The subscribers are to appoint the first directors. Registered office: 101, Strand, W.C.2.

Milliken Brothers, Ltd. (180,722).—Private company. Registered March 29th. Capital, £10,000 in £1 shares. To adopt an agreement with the Milliken Brothers Manufacturing Co., Incorporated, of New York, and to carry on the business of wireless, electrical, mechanical and mining engineers, electricians, suppliers of electricity, manufacturers of and dealers in and etters on hire of the unit system of structural steel as described in Patent No. 17,136, of 1915, &c. The first directors are: C. T. Wilkinson, 35, Hillcroft Crescent, Ealing, W.5 (managing director); W. H. P. Gibson, 49, North Side, Clapham Common, S.W.4, solicitor (chairman); C. T. Clack, Pennsylvania Hotel, New York, steel and iron manufacturer. Qualification, £100. Registered office: Amberley House, Norfolk Street, Strand, W.C.

Jowitt Engineering Co., Ltd. (180,713).—Private company. Registered March 29th. Capital, £750 in 1s. shares. To take over the business carried on by the Jowitt Engineering Co., to adopt an agreement with J. E. Hackford, B.Sc., and R. F. Power, and to carry on the business of manufacturers of gas producers and rotary and reciprocating engines of all kinds, whether for oil, gas, steam, water, electricity or other motive power, &c. The permanent directors are: J. E. Hackford (chairman), 37, Mecklenburgh Square, W.C., chemical engineer; R. F. Power, 110, Victoria Street, S.W.1, engineer. Qualification, 200 shares. Remuneration as fixed by the company. Solicitors: Warren Murton & Co., 45, Bloomsbury Square, W.C.1.

Henry Summers & Sons, Ltd. (180,666).—Private company. Registered March 28th. Capital, £3,000 in £1 shares (1,300 8 per cent. cumulative preference and 1,700 ordinary). To take over the business of electrical and general engineers, &c., carried on at 1a, Eslan Street and 13a, Anchor Street, Stepney, E., by H. Summers, W. D. Summers and L. Summers. The first directors are: H. Summers, 40, Shrewsbury Road, Forest Gate, E.7 (life managing director); W. D. Summers, 40, Shrewsbury Road, Forest Gate, E.7; L. Summers, 35, Chester Road, Wanstead, E.11. Qualification (except first directors), £50. Remuneration as fixed by the company. Secretary: L. Summers. Registered office: 1a, Eslan Street, Stepney, E.1.

Neon Lights, Ltd. (180,617).—Private company. Registered March 25th. Capital, £10,000 in 7,500 10 per cent. cumulative participating preference shares of £1 and 5,000 ordinary shares of 10s. each. To acquire the rights and other interests in the agency and concession for the United Kingdom, granted to E. Bailey, trading as the Electrograph Co., of 9, South Side, Clapham Common, S.W., under an agreement between himself and Paz and Silva, of Paris, for 3,500 fully paid 10 per cent. preference and 3,000 fully paid ordinary shares, and to carry on in the United Kingdom or elsewhere the business of manufacturers and factors of, agents and advertisement contractors for and dealers in neon lamps and lights and any electrical scientific, mechanical and other device in which the said lamps and lights can be used, &c. The life directors are: A. G. Read, 115, Baker Street, W., advertising agent and managing director Read and Leney, Ltd. (managing director); E. Bailey, 9, South Side, Clapham Common, S.W., F.C.R.A. Qualification, £100. Remuneration as fixed by the company. Registered office: 115, Baker Street, W.1.

Globe Supplies (Electrical), Ltd. (180,704).—Private company. Registered March 29th. Capital, £500 in £1 shares. To carry on business as indicated by the title. The subscribers (each with one share) are: F. Bruce, 159, Pentonville Road, N., pianoforte manufacturer; J. R. Whitehouse, 159, Pentonville Road, N., electrician. F. Bruce signs as director. Remuneration: one guinea each per meeting attended. Solicitor: C. H. R. Taylor, 17, Charing Cross Road, W.C.1.

Light and Power Co., Ltd. (180,591).—Private company. Registered March 24th. Capital, £2,000 in £1 shares. To carry on the business of electricians, mechanical engineers, manufacturers and workers of and dealers in electricity, motive power and light, &c. The first directors are: W. Cussens, 23, Dovercourt Road, Sheffield, secretary; H. R. Brown, 4, Lawson Road, Sheffield (life chairman). Qualification, £25. Remuneration as fixed by the company. Secretary: W. Cussens. Registered office: 39, Norfolk Street, Sheffield.

OFFICIAL RETURNS OF ELECTRICAL COMPANIES.

County of Dorset Electric Supply Co., Ltd.—Issue on March 22nd, 1922, of £500 debentures, part of a series already registered.

North Wales Power and Traction Co., Ltd.—Mortgage dated March 9th, 1922, to secure £16,500, charged on transmission line gear, transformers and apparatus incident or annexed thereto constructed between Capel Curig and Penrhyn Quarries, Carnarvonshire, pursuant to a certain agreement. Holder: Lord Penrhyn.

British Electron, Ltd.—Mortgage on land, works, machinery, &c., at Trafford Park, Manchester, dated March 15th, 1922, to secure all moneys due or to become due from the company to L.J.C. and M. Bank.

Modern Electrical Supply Co., Ltd.—Particulars of £5,000 debentures authorised by resolution of March 9th, 1922, whole amount issued; charged on the company's undertaking and property, present and future, including uncalled capital.

Chase Brothers, Ltd.—W. Peet, of 39, Mark Lane, E.C., was appointed receiver and manager on March 18th, 1922, under powers contained in debenture dated October 25th, 1920.

John Spencer, Ltd. (56,764).—Return dated December 6th, 1921. Capital, £75,000 in 10,000 preference and 5,000 ordinary shares of £5 each. 10,000 preference and 1,027 ordinary shares taken up. £55,135 considered as paid. Mortgages and charges, £25,000.

Huntalite, Ltd. (formerly Hunter Electric Candle Lamp Co., Ltd.) (81,387).—Capital, £2,000 in £1 shares. Return dated November 16th, 1921. 1,800 shares taken up. £1,500 paid. £300 considered as paid. Mortgages and charges, nil.

Yorkshire (West Riding) Electric Tramways Co., Ltd. (84,167).—Return dated February 17th, 1922. Capital, £600,000 in £5 shares (70,000 preference). 46,261 preference and 40,977 ordinary shares taken up. £436,190 considered as paid. Mortgages and charges, £272,373.

Provincial Tramways Co., Ltd. (6,445).—Return dated January 14th, 1922. Capital, £275,440 in 10,000 ordinary shares of £10 each and 175,440 ordinary shares of £1 each. 10,000 preference and 124,560 ordinary shares taken up. £10 per share called up on 3,814 preference and £1 per share on 124,560 ordinary. £162,700 paid. £61,860 considered as paid on 6,186 preference. Mortgages and charges, £175,000.

CITY NOTES.

Bromley (Kent) Electric Light & Power Co., Ltd.

During 1921 the connections increased from 5,479 to 5,726 kW. To meet the increasing demand, a bulk supply from the West Kent Electric Co., Ltd., has been arranged for. Additional machinery and mains are being laid down to utilise this supply at a cost of £15,000, drawn from the general reserve, and it is proposed to capitalise this amount by the issue of bonus shares to the value of £15,000 to the existing shareholders. Extraordinary general meetings are to be held to approve the issue of these bonus shares and for convenience to authorise the conversion of the existing £5 shares into five shares of £1 each. The gross profit for the year was £17,575, compared with £12,611 in 1920. After payment of debenture interest, trustees' fees, &c. (£3,002), writing off £3,000 of the cost of investments, and adding £1,314 brought forward, there is a balance of £12,887. A dividend of 10 per cent. for the year will absorb £7,500; £4,500 is to be placed to depreciation and renewal reserve account, and the balance of £887 carried forward.

Dutch Glow Lamp Works.

The report of the directors of the N. V. Philips' Gloeilampen Fabrieken, of Eindhoven, states that one half of the new factory buildings was brought into use during 1921, and it was hoped that the other part would be in full operation before next August. Efforts were constantly being made, both in the physical and chemical laboratories, as well as in the mechanical shops, to discover new improvements and bring them into practical working. Although the economic situation of the whole world was still very uncertain the directors could look hopefully to the future, thanks to the strong position of the company and the fact that orders were on hand for a long time forward. The gross profits amounted to 6,041,000 florins, as compared with 10,150,000 florins in 1920. With an eye to the future and the maintenance of the strong position in relation to competition, it was proposed to leave untouched the reserve fund of 5,208,000 fl. for extensions and to write off the whole of the expenditure incurred on extensions in 1921, namely, 4,481,000 fl. on machinery, apparatus and instruments, buildings, and housing accommodation. The net profits are 1,560,000 fl., as against 7,145,000 fl. in 1920, and the dividends, as mentioned a fortnight ago, are 7 per cent. (11 per cent. in 1920) on the preference shares and 11 per cent. (31 per cent.) on the ordinary shares. The ordinary share capital is 10,200,000 fl., and the preference shares 4,500,000 fl., as in the previous year.

The N. V. Pope's Metaal Draadlampen Fabriek, of Venlo, proposes to pay a dividend for 1920-21 at the rate of 6 per cent. on the cumulative preference shares, as contrasted with 7½ per cent. in the previous year, and to carry the balance forward.

Waste Heat and Gas Electrical Generating Stations, Ltd.

The annual meeting was held in Newcastle on March 31st. Mr. E. Lloyd Pease, who presided, said that the capital expenditure had been £20,664, £15,000 in connection with the new power station at Horden, and the balance on the gas engines at the extensions at Weardale power station. There were certain other items still to be paid in connection with the Horden power station, but it was not likely that they would exceed £10,000. The depression in the coal and iron trades had resulted in a very much reduced output from their generating stations. The miners' strike resulted in the coke ovens and blast furnaces, from which they got their waste heat, being entirely closed down, and some of them had not even yet been re-opened. The first station to start again after the strike was the new Horden station, and in August Ayresome and Teesbridge were re-started, and those stations had been working satisfactorily ever since, although he was sorry to say there was a prospect of Teesbridge being shut down owing to lack of improvement in the iron trade. Newport, which was their station with the greatest capacity, had been re-started, but was only working on a comparatively small output. Weardale was still shut down, and so far as they could hear there was no immediate prospect of its re-starting. The bad trade conditions had also affected the company's investments in the Bankfoot Power Co., which utilised waste heat and gas from two banks of coke ovens at Bankfoot and Bowden Close. Both of that company's stations were shut down completely for some time, and were only working on small capacity. He was afraid they would have to wait for improvement of general trade conditions before there was any material improvement in their output. In view of the difficulties of trade during the year the directors considered the results very satisfactory, but they did not consider it wise at present to draw further on the amount brought forward, but to pay only 6 per cent., carrying forward £13,000. They hoped that the present year would show better results, but prospects were not bright.

Argentine Tramways & Power Co.

For the year ended September 30th, 1921, the gross receipts of the tramway department were $690,657 paper, an increase of $128,271 paper. The gross receipts of the light and power department were $336,314 paper, an increase of $66,447 paper. The net receipts from operation totalled £28,028, an increase of £5,442. Including interest and transfer fees the revenue was £28,559, against £26,893. After charging interest and sinking fund on debenture stock and London expenses, and transferring £5,000 to reserve for renewals, there remains £10,245. A scheme of arrangement, recently approved by holders of preference and ordinary shares, provides, *inter alia*, that £18,323 standing to credit of revenue account at September 30th, 1920, shall be carried to reserve, and shall not be treated as profit available for dividend. Subject to the scheme being approved by the Court, and to £50,000 of 5 per cent. debenture stock, subscriptions for which have been conditionally promised, being allotted, the directors propose a dividend at the rate of 5 per cent. (less tax) on the preference in respect of the past year, carrying forward the balance.

Edison Swan Electric Co., Ltd.

The directors, in their report for the year ended June 30th, 1921, state that, after providing for the adjustments shown in the accounts, the balance standing to the debit of profit and loss is £344,720. The board recommends that £55,000 now standing to reserve be transferred to profit and loss account, thus reducing the debit balance to £289,720. The directors regret that the operations of the company should have resulted in the loss shown, but the general depression in trade has adversely affected all industrial undertakings, and the fall in values of all raw materials and manufactured goods has been unprecedented. The adverse trade conditions have been aggravated and accentuated by the moulders', coal miners' and shipwrights' strikes. The first of these labour troubles commenced in September, 1920, and continued for four months, and had the effect of restricting the activities of practically every trade in which metals formed a part. The strike of shipwrights necessitated vessels being sent to Continental ports to be fitted out, which resulted in a very serious loss of business to the company. The coal strike, lasting four months, resulted in the company's business being practically brought to a standstill in many parts of the country. Under these circumstances the works could only be operated on a scale considerably below their full capacity, and various workshops were not able to carry their due proportion of overhead charges, which have been a heavy burden upon the business, but every effort has been made to reduce them to the lowest figure. A complete and searching valuation of stocks of raw materials and manufactured and partly-manufactured goods has been made, and it has been found necessary to write off as depreciation the

large sum of £346,445, which accounts for the greater portion of the loss made. Since November last the position of the company has slowly improved, and with a moderate revival of trade the outlook for the company should become much more favourable. Since the date of the balance sheet, loans from the company's bankers have been increased by £90,150, making the total loan advanced by them to date £513,950. A meeting of shareholders held last November authorised an increase in the borrowing powers of the directors on behalf of the company. To provide the necessary security for the advances made, the Board has issued to the bank £100,000 second debenture stock, together with a further specific charge of £66,000 upon certain of the properties of the company.

Mr. A. F. Philips and Mr. G. L. E. Philips, of Philips Glowlampworks, Ltd., of Eindhoven, Holland, have retired from the board as technical directors. Subsequent to such retirement the board, under legal advice, commenced proceedings against Philips Glowlampworks, Ltd., with the view of determining the agreement existing between that company and the Edison Swan Electric Co., Ltd., and also in relation to other matters. Mr. C. E. Hunter resigned his position as managing director of the company in January, 1921, and Mr. C. J. Ford has been appointed in his stead.

Meeting, April 11th, at Winchester House, E.C.

Brush Electrical Engineering Co., Ltd.

The profit and loss account for the year ended December, 1921, shows that after providing for general charges, maintenance of plant and buildings, and interest on the company's debenture stocks and loans, there remains a balance of £232,602, making with £141,983 brought forward a total balance of £374,586, subject to E.P.D. for 1920 and previous years, Income and Corporation Profits Taxes, and directors' additional remuneration. There is allocated to depreciation of buildings and plant £14,400, to depreciation of patents and goodwill £600, to further 4 per cent. interest on the prior lien participating second debenture stock £2,044, and to general reserve £7,319, leaving £90,235, out of which it is proposed to pay a dividend at the rate of 15 per cent. per annum on the ordinary shares for the year, absorbing £68,009, paying directors' additional remuneration £2,267, and carrying forward £214,074.

The general reserve account has been increased by £1,809; profit on purchase of the company's debenture stocks for sinking fund purposes, and £73,191, now appropriated to it, raises the general reserve fund to £150,000. £92,809 was expended on capital account during the year. The remaining extensions in hand of the Loughborough Works have made good progress and should come into service in the course of the current year. The company entered the year 1921 with a substantial volume of orders in hand. Notwithstanding the general trade depression which prevailed during the year, the works were kept fully employed, the output of Brush-Ljungstrom turbo-generator sets in particular having largely increased. In July, 1921, a fire occurred at the Loughborough works, resulting in the destruction of a large timber shed and contents. A satisfactory settlement has been effected with the insurance companies in respect of the loss thereby incurred.

Meeting: Monday, April 10th.

British Aluminium Co., Ltd.

Mr. A. W. Tait, C.B.E., presided on Friday last at the annual general meeting, held at Winchester House, E.C. He said that the net profit amounted to £221,506, as compared with £428,157 in 1920. The trading profit was £183,041, as against £373,779, or a decrease of approximately £190,000. The substantial decrease in the trading profit was not unexpected. He mentioned at the last annual meeting that the trading for the year 1920 had been a record one, not only for the company but also for the industry, but he warned the shareholders that a sudden falling off in demand had become evident in August of that year due to the collapse, not only in this country but all over the world, of the motor-car industry, which was a very large consumer of metal in ingot and manufactured forms. He also mentioned that there had been a considerable falling off in other channels of trade, both at home and abroad. This depression assumed serious proportions about the end of the year, and continued with increasing severity during the whole of 1921. The result of the sudden and continued slump in trade was an overproduction of metal. They immediately took steps to meet the conditions by closing down two of their aluminium plants and one of their alumina plants and reducing production at their other works. Those drastic steps which were taken in the early part of the year were necessary to prevent the accumulation of stocks at high prices and the consequent locking up of resources. So far, there had been no great improvement in the position, and their aluminium works in Norway were still closed down, although they had somewhat increased output at their works in Scotland. He could not see how they could expect business to show definite signs of improvement until there was a more or less general return to normal trading conditions. Owing to the competition of other producers, the price of the metal had fallen substantially during last year, and was now practically on the basis of pre-war values. There was reason, therefore, to hope that should trade generally show some signs of improvement, there would be a fairly quick recovery in the industry. The uses of the metal in industry generally were increasing every day, and the research which had taken place and was all the time going on, particularly in alloys, had revealed certain valuable discoveries which, when thoroughly tested and brought into use, should increase substantially the demand for the metal. Costs had been abnormal in consequence of the falling off in production and the closing down of certain of the works. Costs were also increased by the coal strike. Labour rates reached their high point in the spring of last year, but they had been able to obtain certain reductions since then in consequence of the decrease in the cost of living. He believed there would be further decreases in the costs of materials and labour, all of which would enable them to compete on better terms for such business as might be available, and also to develop the uses of the metal in certain directions which promised a large consumption in future. It was satisfactory to note that the French Government, which placed a 20 per cent. ad valorem export tax on bauxite after the end of the war, had now repealed that tax in its entirety, and as they were large bauxite users, that would be of material assistance. Given freedom from international trouble and complications, the recovery of the aluminium industry would be quicker and greater than most people imagined. Having referred to the crushing burden of taxation which the company had to bear in income tax and Corporation Profits Tax, the Chairman mentioned the Lochaber water power scheme promoted by the company, and said that steps would not be taken to proceed with the scheme until the general conditions of trade and the expansion of their own industry warranted it, but the directors considered that the powers obtained were an asset of potential value to the company. Proceeding to refer to the balance sheet, he said that stocks of metal, raw materials, and stores, at £399,322, showed a reduction of approximately £48,600 as compared with the previous year. During the year the prior lien debentures outstanding had been reduced by £13,700, and now stood at £700,800, and the debenture stock had been reduced by £10,096, and now amounted to £611,989. In order that the shareholders might more clearly appreciate the reserves which had been created in the company, but which were, of course, invested in its business, they had placed together in the account the redemption accounts and the depreciation reserve account, which, with the allocation of £20,000 out of the profits of the year, now amounted to £570,000. Those two reserves together made a total of £787,174, which, he thought, could be regarded as a substantial figure to meet any decline in valuation or depreciations which might have occurred in their fixed assets. The reserve account had been increased to £180,000 by £10,000 set aside out of the profits of the year. The total reserves of the company, therefore, amounted to approximately £967,000, which was very little short of the total issued ordinary share capital. It was by reason of those reserves that the company had been able to build up its business and to increase its productive capacity, and had also been able to go through a period of depression, such as they, along with others, were experiencing at the present time, without undue anxiety. The accounts justified the dividend which they were recommending, and, although that showed a substantial reduction on the rate of dividend paid in respect of the previous year, he had mentioned the reason for the substantial reduction in their profits, and on the whole he thought the results were not unsatisfactory considering the period of acute depression through which the industry had passed. He did not mean to say that this period was finished, but he did believe that the worst was behind them, and, if they could only obtain some relief from the burden of taxation, and Europe would show signs of settling down, it should not be very long before there was some revival in industry, in which he felt sure they would get their full share. Major R. W. Cooper, O.B.E., seconded the motion, which was carried unanimously.

Folkestone Electricity Supply Co., Ltd.

During 1921 the equivalent of 13,372 8-c.p. lamps were connected (making 212,180). Including the receipts from hired installations, the profit on the revenue accounts for the three undertakings amounted to £17,681, an increase of £2,767. This amount, with £832 brought forward and interest on investments, &c., and after allowing for interest on debenture stock and bank overdraft, and dividend on preference shares, showed a balance of £12,317. Out of this £7,561 is put to depreciation fund, £1,525 to reserve fund, and a dividend of 4½ per cent. (less income tax) on the ordinary shares for the year will require £2,375, leaving £855 to carry forward. The payment of the dividend recommended is subject to the consent of the Electricity Commissioners. Application has been made to the Electricity Commissioners for extended powers in the district by incorporating the Urban District of Cheriton and the parishes of Saltwood, Newington, and Hawkinge in the company's area of supply, but the formal Order has not yet been obtained. The board has approved substantial extensions to plant, and orders have been placed for additional machinery. Some portion of this has already been installed and the remainder should be running in time for the season load. It is not proposed to make any issue of loan capital for the present, but to obtain the necessary cash required by means of temporary loan. Since the close of the financial year the company's holding of War Stock and War Bonds has been sold and has realised a small profit on the purchase price.

Newcastle-on-Tyne Electric Supply Co., Ltd.

Mr. R. P. Sloan, C.B.E., presided at the annual meeting, held in Newcastle, on March 28th. After appreciative reference had been made to the late Dr. Merz the chairman said that the past year had been one of unparalleled trade depression. Their prosperity depended upon the trade done on the North-East Coast, for practically every industry was served by the power company. It frequently happened that depression in one industry was counter-balanced by prosperity in another, but last year trade depression and the mining stoppage affected, more or less, every class of consumer. Their domestic supplies, however, for lighting, heating, and cooking, were not seriously affected. They had had to expend considerable sums of money on extending their system in Newcastle, and there were signs of a very substantial increase in that particular line of their business. The profits of the year had amounted to £347,218, a reduction of £45,425 upon the previous year. The directors were extremely disappointed that the results did not enable them to recommend the payment of a dividend upon the ordinary shares. Their costs had not fallen to the same extent as had their output, and as a result, during the coal stoppage they had incurred a considerable loss. They had to pay high rates for the labour they employed. Their total labour bill was £399,979, as against £394,195 in 1920, which represented an average of about 180 per cent. above pre-war rates per employé. Certain reductions came into operation at the end of the year, the cumulative result of which would be considerable saving during the year. Another heavy charge they had to bear was that of rates, and the average rate in the £ which they had to pay last year represented 166 per cent. more than the average rate for 1914. Another special item of cost was their share of the expenses of the department of the Electricity Commissioners. He had always thought that much good would result from the setting up of that body, whose primary object was to secure an abundant and cheap supply of electricity. He did think it unfair, however, that the greatest burden of the expense of that body should fall on those undertakings which most nearly approached the Commission's ideal. Referring to the suggested electrification of a portion of the main line of the North-Eastern Railway, he said that had not yet materialised, and in view of railway amalgamations it was difficult to say what developments were likely to take place in that connection. With regard to the prospects for the current year the chairman said that with all the uncertainty and unrest in the industrial world it was almost impossible to make any forecast. The dispute in the engineering industry, he hoped, would soon be settled. Shipbuilding industry was the most depressed of any of the local industries, but he was glad to say that there were distinct signs of improvement in the coal mining industry, and as they included a large number of collieries amongst their customers they should benefit accordingly. If the reductions in expenses should continue, and with the extended use they should make of their newer and more economical plant, there ought to be an improvement in the results in the coming year. The adoption of the report was carried with two dissentients.

Metropolitan-Vickers Electrical Co., Ltd.

The report shows that the available profit for the year ended December, 1921, including £58,824 brought forward, is, after providing for taxation, £395,926. Out of this £35,000 has been put to special depreciation of plant, machinery, &c., and £100,000 to general reserve account. Dividends of 8 per cent. on the preference shares and 12½ per cent. on the ordinary, less income tax, require £168,111, and there remains to be carried forward £92,815. Orders received during the year, owing to the prevailing trade conditions, show a falling off as compared with 1920. The works were, nevertheless, partly due to orders carried forward from 1920, kept well employed, and, but for the labour troubles and the coal strike, the accounts would have shown an even better result. During the year 25,523 preference shares have been converted into 51,046 ordinary shares, making a total of 68,475 preference shares so converted. An application for a quotation of the ordinary shares resulting from the conversions in 1921 is now before the Stock Exchange, and when the quotation has been granted the whole of these ordinary shares will be in all respects identical with those now quoted. Mr. Alexander Spencer, a member of the board for many years, has been chosen as vice-chairman in place of the late Sir Francis H. Barker.

Clyde Valley Electrical Power Co.—The annual meeting was held in Glasgow on March 30th. Sir Frederick C. Gardiner, who presided, stated that in view of the coal strike and the general trade depression the results were satisfactory. Contracts for supply showed an increase during the year of 13,390 h.p., and connections to mains an increase of 15,201 h.p.

Loxley Bros., Ltd.—A financial contemporary states that the board has decided to postpone payment of the dividend on preference shares for the half-year ended March 31st pending the preparation of the balance sheet to that date.

British Engine, Boiler, and Electrical Insurance Co., Ltd.—After reserving £12,411 for income tax and corporation tax and adding £5,030 to pension fund, the directors recommend a final dividend of 11s. per share, and the usual bonus of 4s. (both less tax), carrying forward £13,416.

North Melbourne Electric Tramways & Lighting Co., Ltd.—The *Financier* states that an extraordinary general meeting and a separate meeting of the holders of the 5 per cent. debentures were to be held yesterday to consider an offer from the State Electricity Commission of Victoria for the acquisition of the company's undertakings. After lengthy negotiations the Commission has offered £110,000, and to take certain stores at a valuation (not to exceed £3,000). Payment is to be made as to £25,000 in cash, and the balance in Victoria (Australia) Government 6 per cent. debentures, having a currency of 12 to 13 years (as may be arranged), such Government bonds to be accepted by the company at par. As the price offered is insufficient to pay the debenture-holders in full there will be nothing left to distribute amongst the shareholders.

Bristol Tramways and Carriage Co., Ltd.—The revenue for 1921 was £1,022,208, and the working and general expenses and renewals £951,589, leaving, with the balance brought forward and with an amount recovered on an adjustment of income tax, a net revenue balance of £104,100. After meeting debenture stock and loan interest (£31,249), paying 4 per cent. on the preference shares and 7 per cent. free of tax on the ordinary shares, £3,668 is to be carried forward. The reserve fund amounts to £339,557. The receipts of the tramways department show an increase of £112,186 and those of the carriage department a decrease of £7,996. The number of passengers carried on the company's cars and motor omnibuses was 72,301,531, as compared with 84,983,434 in the previous year, a decrease of 12,681,903.

Torquay Tramways Co., Ltd.—Mr. Harold T. Barnett, presiding at the annual meeting on March 30th, said that in spite of losses due to the coal strike, the annual revenue had increased by £710, and the number of passengers carried was a record for the company. There was a net profit of £36,178, and after providing for debenture service, a dividend of 8 per cent., free of income tax, was paid, leaving £2,206 to carry forward. The formation of a separate company to carry on the motor 'bus undertaking is being considered.

Sir W. G. Armstrong, Whitworth & Co., Ltd.—Final dividend on the ordinary shares for 1921 2½ per cent., making 5 per cent. for the year, against 10 per cent. for 1920. *The Times* says that the dividend, though lower than a year ago, is equal to the most sanguine expectations, and must be regarded as indicating a considerable measure of success in developing the civil engineering side of the business, in spite of the depression prevailing in the industry.

Slough and Datchet Electric Supply Co., Ltd.—During 1921 the capital expended was £10,496 on cable extensions and a new boiler, making £105,877. 3,390 lamps (30 watts) equivalent added, making 57,183. Units sold fell from 2,225,331 to 1,955,849. Revenue increased from £26,664 to £31,106. Net profit £8,930. £3,000 to depreciation and reserve; dividend 6 per cent., less tax; £2,839 carried forward.

Salisbury Electric Light and Supply Co., Ltd.—During 1921 a 1,200-kW set was added. The balance on the year's working was £9,103 (as against £7,531 in 1920). Debenture interest absorbs £733. Out of the balance, plus £3,695 brought forward, a total dividend of 10 per cent. for the year is to be paid; £7,500 goes to reserve, and £1,065 is to be carried forward. Mr. J. C. Wigham has retired from the board, and Mr. A. N. Rye has been elected in his place. The annual meeting was held on March 21st, Mr. C. J. Woodrow presiding.

Nairobi Electric Power and Lighting Co., Ltd.—At an extraordinary meeting of members, held on March 29th, the appointment of Mr. G. A. Higlett as liquidator was confirmed, and on the same day he sent out notices declaring a first distribution of capital at the rate of 24s. per £1 share. The debentures and known creditors were also paid off.

South London Electric Supply Corporation, Ltd.—Dividend of 4½ per cent. on the ordinary shares for half-year, making 7 per cent. for the year; £12,500 to reserve for depreciation, &c.; £17,500 to general reserve; £5,000 to reserve for contingencies; £5,661 carried forward.

New York Telephone Co.—Total net earnings for 1921, $21,393,035, less $8,148,492 for interest charges, leaving net profit of $43,244,543. Dividends amounting to 8 per cent. have been paid; surplus of $403,296 carried to total surplus.—*Financial Times.*

Windsor Electrical Installation Co., Ltd.—During 1921, £2,798 was spent on capital account. The profit was £7,590 (including £1,424 brought forward). Debenture and other interest £562; 5 per cent. preference dividend, £824; depreciation, renewal and reserve fund, £2,500; directors' fees, £500; dividend on ordinary shares, 4 per cent., less tax; £1,804 carried forward. The demand for electricity is well maintained. 2,708 (30 watt) lamps equivalent having been connected, making 72,806.

A. Reyrolle & Co., Ltd.—Profit for 1921, £64,662 (including amount brought forward); £15,000 put to reserve; dividend 12½ per cent. on the ordinary shares; carried forward £12,190.

Prospectuses.—*Whitehall Electric Investments, Ltd.*—This company, concerning which particulars are given in our "New Companies Registered" section to-day, has been publicly offering for sale £2,500,000 6 per cent. first mortgage debenture stock (1925 to 1949) at 87½ per cent., and 1,500,000 7½ per cent. cumulative preference shares of £1 each at par. The Hon. Clive Pearson is chairman, and the following are the other directors: Sir Clarendon G. Hyde, Messrs Vincent W. Yorke, John H. Macdonald, and A. E. Worswick. The offices are at 47, Parliament Street, Westminster, S.W.1. The offer is made by the Whitehall Trust, Ltd., which has acquired the stock and shares from Whitehall Electric Investments, Ltd. The prospectus contains a lengthy statement regarding the companies in which the new concern is largely interested, and gives particulars of the net income receivable therefrom on the basis of figures for the last three years. The undertakings referred to are: Compania Chilena de Electricidad, Limitada; Compania Electrica de Tampico, S.A.; Puebla Tramway, Light & Power Co.; Vera Cruz Electric Light, Power and Traction, Ltd.; Compania de Luz Electrica y Fuerza Motriz de Orizaba, S.A.; and the Compania Veracruzana de Luz y Fuerza, S.A. According to a statement signed by the chairman (the Hon. Clive Pearson) and given in the prospectus, the companies referred to have now in operation 73,700 h.p. in hydro-electric and steam plants, 49,000 h.p. being owned and 24,700 h.p. on lease. "The combined lengths of the tramway systems is 166 miles with an equipment of 589 cars. The number of customers to whom light is supplied is not less than 40,000, and motors connected to power users aggregate approximately 40,000 h.p. The hydro-electric and steam power now being developed exceeds 80,000 h.p., and the companies have various water rights in reserve for future needs." The company has been formed mainly for the purpose of acquiring interests in companies engaged in supplying power and light to cities, towns and industries, and in operating tramways, and of assisting in the development of electrical undertakings generally. It is proposed that, as a general rule, the company shall hold a majority of the ordinary share capital of companies in which it is interested. The object of the present issue is to provide £3,250,000, which will be used in repaying Whitehall Securities Corporation, Ltd., £1,150,000, being the amount already provided by it, and in payment to that company of the balance of £2,100,000 for the further developments above referred to. The balance of £257,500 will be available for working capital of Whitehall Electric Investments, Ltd.

The list of applications was to close on or before yesterday.

Metropolitan Railway Co.—An issue of £600,000 five per cent. preference stock is being offered at 87. The list opened on Wednesday and is to close to-day (or before).

London Electric Wire Co. and Smiths, Ltd.—The directors report that during 1921 the additions to buildings and plant have been practically completed. The usual provision has been made for depreciation. It is necessary to continue a careful policy, therefore, out of a profit of £83,924, plus £38,926 brought forward, £50,000 is put to reserve, making the general reserve account £150,000. The special reserve account remains at £20,000. After paying the preference dividend, less tax, a final dividend on the ordinary shares is recommended, which, with the interim dividend paid last June, will make a total rate of 7½ per cent., less tax, for the year, leaving to carry forward £44,545.

The company is naturally affected by the depressed state of trade, customers' orders on hand being considerably less than heretofore. The death is recorded of Mr. A. L. Don, an original member of the board.

Windermere and District Electricity Supply Co., Ltd.—Gross revenue during 1921, £8,382; an increase of £1,725. Working expenses, £5,677, an increase of £818. Keswick Electric Light Co. has again paid 5 per cent. on account of arrears of debenture interest, and this company's share is £334. The revenue balance, including £324 brought forward, is £3,364. Debenture interest, bankers charges, &c., require £1,083. £1,000 has been put to depreciation reserve, and a dividend of 3 per cent. is to be paid on the preference shares leaving £441 to carry forward.

Midland Electric Corporation for Power Distribution, Ltd.—Mr. James Taylor, presiding at the annual meeting of the company on March 27th, said that although not so high as last year, the profit was still good. The year had been one of difficulties. A serious breakdown of plant occurred early in the year, then came the coal strike and bad trade. Owing to increased costs, they had had to raise their charges and he was afraid that it would be a long time before they could return to pre-war rates. Referring to the formation of electricity districts, Mr. Taylor said that the shareholders' interests were being carefully watched.

Stock Exchange Notices.—Dealings in the following have been specially allowed by the Exchange Committee under Rule 148a:—

Cordoba Light, Power and Traction Co.—£243,877 new 6 per cent. debenture stock (ranking for interest from December 1st, 1921); and £150,000 new 6 per cent. debenture stock (ranking for interest from April 1st, 1922.)

Taunton Electric Traction Co., Ltd.—Total receipts for 1921, including £611 brought forward, totalled £2,749. After meeting expenses and paying debenture interest, there is a debit balance of £225.

W. Canning & Co., Ltd.—The *Financial Times* reports that the accounts for 1921 show a loss of £23,671, after charging all expenses, including maintenance and full depreciations of properties, plant and fixtures, less a surplus of £1,452 brought in, leaving a deficiency of £22,218 to be carried forward.

STOCKS AND SHARES.

TUESDAY EVENING.

THE principal feature of the week is the way in which Home Railway stocks have been advancing. The Undergrounds joined in the general buoyancy shown by the market, and, although something of a reaction occurred from the top, the general disposition has been to keep prices at high levels. Nevertheless, the cautious see in the present position an element of danger. If people started selling their stocks with any degree of freedom, there would certainly be a substantial reaction, because the rise has rushed up prices at an extremely rapid pace, and it would not require much of a selling pressure to bring about a fairly violent fall. Several companies are known to be on the point of issuing fresh capital, and amongst these the Metropolitan is one of the earliest to make an appeal. The stock is £600,000 in 5 per cent. preference at 87.

Metropolitan Consolidated and District ordinary have been two of the leaders in the activity of the past few days. Districts are 5 points up. Underground Electrics also came to the front with a run, the £10 shares jumping 10s. to 2¾, the shilling shares gaining 1s. 6d. at 7s., and the incomes being 5 better at 76¼. So ready is the appetite of the public to absorb railway stock at the present time that even the Contingent Certificates of the Underground Electric Railways Co. have been sought out by the gamblers, who have given prices ranging from 6d. to 9d. for these extremely speculative insecurities. Together with the ordinary issues, those in the prior-charge groups moved up sympathetically; debenture, preference, guaranteed and rent-charge stocks are mostly better, by several points, than they were this time last week. Central London ordinary and deferred, non-assented, have advanced to 40 and 36¼ respectively.

The higher prices to which electricity supply shares have attained are having the very natural effect of bringing in a few sellers. There is no lowering of quotations, however. In point of fact, prices are generally a little better on the week. The position is that instead of there being only buyers and no stock on offer, there is at the present time a fair amount of supply to be obtained in some of the leading companies. This is, of course, all to the good of the market, since it increases the flexibility, and also the popularity, of electric lighting shares. If investors find, after persistent inquiries, that they are unable to get stock in any particular section, they will give up the attempt and utilise the money in other directions. But supply of stock encourages business, and yields to be obtained from electric shares are still good. For instance, 7¼ per cent. is afforded by Charing Cross ordinary, Metropolitans and Westminsters; while Chelseas yield only 5¼ per cent., the rise in their case having been particularly marked. South Metropolitan ordinary at 30s. are on a 6¾ per cent. basis of yield, but 8 per cent. or over is still obtainable from Bromptons, Kensingtons, St. James's, South Londons and London Electrics.

Bromley (Kent) Electric Light & Power ordinary shares are 5s. higher on 4¾. The dividend is announced at 10 per cent., and the directors propose to capitalise £15,000 from the reserve fund, by the issue of bonus shares to proprietors. It is further intended to divide each existing £5 shares into five shares of £1 each. Shareholders should keep their shares as a good investment. Charing Cross ordinary have risen to 6¼ and the preference to 3¼. Other changes in the list are insignificant, being caused mainly by deduction of dividends in several cases.

Shropshire Electric debenture improved to 102. Yorkshire Electric new preference have risen to 9s. 3d. premium over the issue price of £4 per share, for the shares of the nominal value of £5 each. Scottish Power preference at 20s. 6d. are the turn better.

The market for manufacturing shares is steady. English Electric Notes have risen 4 points to 92. Metropolitan-Vickers preference at 2 5/16 are another ¼ higher. London Electric Wire preference advanced to 1 1/32 on the publication of an excellent report. The profit is a little less than it was in the preceding twelvemonth, but the company maintains the 7½ per cent. dividend on the ordinary shares (all privately held), and the balance-sheet is a good example of what such documents should be. The amount of liquid assets is unusually large.

The Edison & Swan report shows a disastrous state of affairs. Last year there was a net profit of nearly £94,000, but this year the debit balance is £344,700. The directors recommend that £55,000 standing to reserve should be transferred to profit and loss. A sum of £346,445 has been written off the value of stocks of raw materials, &c. Next Tuesday's meeting may bring a gleam of consolation. The result caused no nominal alteration in the price of the shares, which remain about 3s. 6d., but naturally they are not easy to sell. That the com-

pany must have done badly it was generally expected would be made manifest when the report appeared, but figures such as these were scarcely expected.

Mexican matters are beginning to look up again, and improvements have occurred in Mexican Electric Light Firsts at 61¼, Pachuca Fives at 62½, Mexican Light & Power Firsts at 65½, and several others. Anglo-Argentine Tramways first and second preferences spurted to 3⅜. British Columbia Electric preference at 66½ is 2 points better. Rio Tramway Fives at 77½ have gained a couple of points, and the market for dollar bonds is fairly firm throughout.

The principal change in the telegraph and telephone list is a rise to 8 in Cuba Submarines (after 8¼), this being 5s. up. Great Northerns are similarly better at 28¾. The Eastern group has scarcely moved. Henleys at 37s. 6d. recovered from a little depression which lowered the price to 36s. 9d. Siemens have been an active and a good market during the past few business days. Although the quoted price remains unchanged at 25s., the market is really better than this would imply.

Babcock & Wilcox rose ¼ to 3, and amongst the newcomers, Jutland Telephone debenture strengthened to 2½ premium. An important issue has been made by the Whitehall Electric Investments, Ltd. Investors have been offered 2½ million pounds 6 per cent. first mortgage debenture stock at 87½ and 1½ million pounds 7½ per cent. cumulative preference of £1 each at par. Ammunition shares are firm. Vickers advancing in company with the strength shown by Metropolitan-Vickers. A rather harder tendency is noticeable amongst rubbers, though business in the shares remains on the smallest possible scale.

SHARE LIST OF ELECTRICAL COMPANIES.

	Dividend. 1920.	Dividend. 1921.	Price April 4, 1922.	Rise or fall.	Yield p.c.
Home Electricity Companies.					
Brompton Ordinary	12	12	7½	—	£8 6 6
Charing Cross Ordinary	8	9	6½	+ ½	7 4 0
do. do. do. 4½ Pref.	4½	4½	3¾	—	6 8 7
Chelsea	6	6	5½xd	—	5 9 1
City of London	14	14	35/-xd	—	8 0 0
do. do. 6 per cent. Pref.	6	6	1xd	—	6 0 0
County of London	8	8	11¼	—	6 15 0
do. do. 5 per cent. Pref.	6	6	9½	—	6 11 6
Kensington Ordinary	9	10	6½xd	—	8 0 0
London Electric	2½	4	1½	—	8 0 0
do. do. 6 per cent. Pref.	6	6	4½	—	7 5 5
Metropolitan	7	7	4½	—	7 7 4
do. 4½ per cent. Pref.	4½	4½	3¾	—	6 8 7
St. James' and Pall Mall	12	12	7½	—	8 5 6
South London	7	7	3½xd	+ ½	8 7 0
South Metropolitan Pref.	7	7	1½	—	6 4 5
Westminster Ordinary	10	10	6½	—	7 8 2
Telegraphs and Telephones.					
Anglo-Am. Tel. Pref.	6	6	97	—	6 3 9
do. Def.	1½	1½	21½	—	8 9 0
Chile Telephone	6	6	5½	—	5 11 7
Cuba Sub. Ord.	7	7	8	+ ½	8 15 0
Eastern Extension	10	10	180	—	5 8 10
Eastern Tel. Ord.	10	10	186½	—	5 7 8
Globe Tel. and T. Ord.	10	10	184	—	5 8 1
do. do. Pref.	6	6	102	—	5 11 7
Great Northern Tel.	23	24	28¾	+ ½	8 7 0
Indo-European	10	10	97	—	6 19 0
Marconi	25	15	2½	—	7 1 9
Oriental Telephone Ord.	13	13	3	—	*8 0 0
United R. Plate Tel.	8	8	6¼	— ⅛	*5 18 6
West India and Panama	Nil	Nil	5/-	—	Nil
Western Telegraph	10	10	18½	—	*5 8 1
Home Rails.					
Central London Ord. Assented	4	4	64	—	6 5 0
Metropolitan	1½	1½	41½	+2	5 8 5
do. District	Nil	Nil	8¼	+5	2 18 10
Underground Electric Ordinary	Nil	Nil	9⅜	+ ⅛	Nil
do. do. "A"	Nil	Nil	7/-	+1/6	Nil
do. do. Income	4	2	16½	+5	*5 4 7
Foreign Trams, &c.					
Anglo-Arg. Trams. First Pref.	5½	12½	8⅜	+ ⅛	7 11 9
do. do. 2nd Pref.	Nil	5½	5⅜	+ ⅛	7 11 9
do. do. 5 per cent. Deb.	5	5	7½	+ ½	6 14 8
Brazil Tractions	Nil	Nil	41	—	Nil
British Columbia Elec. Rly. Pfce.	5	5	66½	+2	7 10 5
do. do. Preferred	5	99/-	58½	—	*7 18 0
do. do. Deferred	8	124/-	89½	—	*10 13 0
do. do. Deb.	4½	4½	70	+2½	6 1 5
Mexico Trams. 5 per cent. Bonds	Nil	Nil	58½	—	—
do. do. 6 per cent. Bonds	Nil	Nil	27½	—	Nil
Mexican Light Common	Nil	Nil	16½	—	Nil
do. Pref.	Nil	Nil	34½	—2	Nil
do. 1st Bonds	Nil	5	55½	+2	7 12 8
Manufacturing Companies					
Babcock & Wilcox	15	15	8	+ ¼	5 6 8
British Aluminium Ord.	10	10	1¼	—	—
British Insulated Ord.	15	15	1¼xd	—	8 5 4
Callenders	15	15	1¼	—9d.	8 11 6
,, 6½ Pref.	6½	6½	1⅛	—	6 7 4
Crompton Ord.	10	10	15/-	—	13 6 8
Edison-Swan	10	—	3/6	—	—
do. do. 5 per cent. Deb.	5	5	62	—	8 1 4
Electric Construction	10	10	20/9	—	9 12 10
English Electric	8	8	9/9	—	14 8 4
do. Pref.	6	6	16/9xd	—	7 7 8
Gen. Elec. Pref.	6½	6½	20/9	—	6 5 4
do. Ord.	10	10	21/-	—	9 10 6
Henley	15	15	1⅞	—	8 0 0
do. 4½ Pref.	4½	4½	4½	—	5 9 1
India-Rubber	10	—	1⅛	—	—
Met.-Vickers Pref.	8	8	2⅛	+ ⅛	0 9 10
Siemens Ord.	10	10	25/-	—	*8 8 0
Telegraph Con.	90	90	24	—	*5 0 0

* Dividends paid free of Income Tax.

MARKET QUOTATIONS.

It should be remembered, in making use of the figures appearing in the following list, that in some cases the prices are only general, and they may vary according to quantities and other circumstances

Wednesday, April 5th.

CHEMICALS, &c.	Latest Price.	Fortnight's Inc. or Dec.
a Acid, Oxalic per lb.	8½d.	½d. inc.
a Ammoniac Sal per ton	£65	..
a Ammonia, Muriate (large crystal) ,,	£58	..
a Bisulphide of Carbon ,,	..	..
a Borax ,,	£50	..
a Copper Sulphate ,,	£37	£2 dec.
a Potash, Chlorate per lb.	5d. to 5½d.	..
a ,, Perchlorate ,,	7½d.	..
a Shellac per cwt	£1 to 15s.	15/- inc.
a Sulphur, Sublimed Flowers ,,	£13	..
a ,, Lump ,,	£12	..
a Soda, Chlorate per lb.	3½d.	..
a ,, Crystals per ton	£7	..
a Sodium Bichromate, casks per lb.	5½d.	..
METALS, &c.		
b Aluminium, Ingots per ton	£120	..
b ,, Wire per lb.	1/9 to 2/6	..
b ,, Sheet ,,	1/8 to 2/-	..
p Babbitt's Metal and Anti-friction Metal—		
Grade I per ton net	£147	..
Grade II ,, ,,	£106	..
Grade III ,, ,,	£62	..
c Brass (rolled metal 2" to 12" basis) per lb.	9½d.	½d. dec.
c ,, Tubes (solid drawn) ,,	11½d. to 1/-	..
c ,, Wire, basis ,,	9½d.	½d. dec.
c Copper Tubes (solid drawn) ,,	1/1½	..
c ,, Bars (best selected) per ton	£85	£2 dec.
c ,, Sheet ,,	£88	£2 dec.
c ,, Rod ,,	£86	£2 dec.
d ,, (Electrolytic) Bars ,,	£84 10s.	£2 dec.
d ,, ,, Sheets ,,	£145 10s.	..
d ,, ,, Wire Rods ,,	£74 10s.	£3 dec.
d ,, ,, H.C. Wire per lb.	9½d.	⅛d. to ¼d. dec.
f Ebonite Rod ,,	4/6	..
f ,, Sheet ,,	3/-	..
g German Silver Wire ,,	2/6	..
h Gutta-percha, fine ,,	12/6	..
h India-rubber, Para fine ,,	10½d.	½d. dec.
i Iron Pig (Cleveland Warrants) per ton	Nom.	..
i ,, Wire, galv. No. 8, P.O. qual. ,,	£27	..
g Lead, English Pig ,,	£23	5/- inc.
g Mercury ,,	£10 15s.	..
e Mica (in original cases) small per lb.	3d. to 3/-	..
e ,, ,, medium ,,	4/- to 8/-	..
e ,, ,, large ,,	10/- to 20/- & up	..
p Phosphor Bronze, plain castings ,,	1/1	..
p ,, ,, drawn bars and rods ,,	1/3½	..
p ,, ,, rolled strip & sheet ,,	1/3½	..
p ,, ,, Wire ,,	1/3½	½d. dec.
e Platinum per oz.	£19 10s.	10/- dec.
d Silicium Bronze Wire per lb.	1/1½	½d. dec.
r Steel, Magnet, in bars ,,	1/-	..
n Tin, Block (English) per ton	£144	5/- to 10/- inc.
n ,, Wire, Nos. 1 to 16 per lb.	2/-	..

Quotations supplied by—

a G. Boor & Co.
b The British Aluminium Co., Ltd.
c Thos. Bolton & Sons, Ltd.
d Frederick Smith & Co.
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f India-Rubber, Gutta-Percha and Telegraph Works Co., Ltd.
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o Johnson, Matthey & Co., Ltd.
p C. Clifford & Son, Ltd.
r W. F. Dennis & Co.

The International Conference on H.P. Transmission Systems.—With reference to the announcement on p. 344 of our issue of March 10th, that the full report of the conference held last November would be published in April, the general secretary of the Union des Syndicats de l'Electricité informs us that the period during which orders from abroad may be placed at the reduced price of 60 fr. has been extended from April 1st to May 15th. Copies may be ordered from the general secretary (25, Boulevard Malesherbes, Paris), stating whether they are to be in French or English.

Service Notes.—Consequent on a Naval officer being put in charge of the Bermuda Wireless Station, Lieutenant E. C. Bearcroft has been ordered to return home to join the Chatham Division, Royal Marine Light Infantry. Recruiting for the electrical departments of both services is rather dull at the moment. The contemplated reductions in establishment have something to do with this. Lieutenant L. S. King, from the London Electrical Engineers, has been posted to the Territorial Army Reserve of Officers. He was commissioned during the late war.

A German Electrical Conference.—During the German Trade Show, to be held at Munich from May to October, there will be held the 28th yearly conference of the Verband Deutscher Techniker, fixed for May 28th to June 1st, at which some 1,500 German technicians are expected to be present. Among the addresses given will be "Long Distance Transmission," "Employment of Electrical Energy for Chemical Purposes," "Electricity in Gases," and "Electrification of Main Lines." The conference will be followed by an "electric week."

TRY ANOTHER WAY.

By "AN EX-MUNICIPAL CLERK."

It seems that some of the Local Authorities' new houses are being wired on the free-wiring system. As the owner of the house and the owner of the wiring will, in these cases, be the same person (or thing, or whatever a Local Authority is), I suppose this means that a proportion of the rent will be allocated to the wiring accounts, and this should not present much difficulty even to the municipal mind.

Incidentally "free" wiring seems about as appropriate a descriptive term as could be found. I have a free house on the same system from which my landlord can evict me any time I fail to produce the instalments of liberty.

The matter will not be so simple if any of the Local Authorities contemplate wiring any other parties' houses with the object of recouping themselves by a separate rental for the use of the wiring. In case the project is being considered—I can't say certainly that it is—by any Local Authority, let it first consider the position of those who already have such systems at work, and have a care and be very careful.

The free-wiring systems at present in existence are, in most cases, white elephants round the necks of their respective undertakings (or let us say "millstones on their hands"—we like to help mix the metaphors.—Eds.).

Some twenty years ago, when municipal engineers were being goaded into fierce efforts to meet gas competition, a brilliant genius conceived the idea of wiring houses entirely gratis and free of charge to the owners—and getting the money back by charging the consumers a rental per point per annum, these charges being so worked out that in the course of about thirty years or so the capital expended would be recovered. The undertaking could then start making a profit.

One or two unexpected factors delayed this consummation somewhat, such as, for instance, houses remaining empty for long periods (this has not been quite so noticeable of late), installations, although carried out in the best casing and capping, requiring to be renewed after a period of service of, say, twelve or fifteen years, and generally troubles resulting from an imbroglio with foreign powers necessitating armed intervention by the Crown forces for some years.

These annoyances were, however, trifles compared with the business of persuading consumers into paying the necessary rent (where the wiring had been done previously to their arrival), and although none but the very stiff-necked or Oriento-Scottish stuck to their guns, undoubtedly the majority were left with a sore feeling that there was a catch in it somewhere.

The procedure when anyone required a supply at a free-wired house was approximately this:—The intending consumer wrote to the electricity offices asking for a supply, and, according as his letter was aggressive, polite, or timid, he would be answered—

By a request for an interview.

By a typical official letter, such as "I have your request for application form for supply and would point out that this should be on the official application form which is enclosed."

The timid ones were told to come to the office.

The consumers' representative (a man of iron nerve with a heart of stone—a sort of human reinforced concrete) always undertook the job of explaining the free-wiring scheme to the first and usually the most dangerous class of applicant, the others being left to smaller fry. He was called "consumers' representative," because officially his job was to look after the interests of the consumers—and Heaven help him if he did.

The most powerful weapon in his hands was, of course, the fact that people who have once tasted the joys of getting light by moving a brass knob can rarely bring themselves to return to the tyranny of the little wooden box. Those whom he failed to reduce to what *he* called a reasonable frame of mind (very few), *i.e.*, who absolutely refused to pay at all, went without a supply altogether. Others who considered the whole business a swindle, and said so, were usually mollified by the farce of labelling a number of points "Not in use," and charging rent only on the remainder, an ingeniously dignified method of bargaining.

I have often wondered what would have been the position if any coarse-fibred person had insisted on his legal right to a supply, at the same time refusing rent for the installation, and I hope some electrical Hampden will do it to satisfy my curiosity.

A point that was always wonderfully clear to the consumer was that while his rent included all fittings and lamps, the lamps he was entitled to were carbon-filament lamps—this because the wiring was done and the agreements were made out in the days of the old carbon lamp, which some of your readers may remember—and if they wanted lamps to see by, they had to pay the difference.

Tenants were not usually so difficult to deal with as people who bought houses (we tenants are a spineless race), owing probably to their ingrained habit of paying moneys periodically for which they received no tangible benefit.

House-owners who occupied their own houses were much worse, and had never by any chance been told, before they bought, that the electrical installation was someone else's property—so they said; and the Council's nameplates had a habit of turning their faces to the wall when house-buyers were about. This wasn't the Council's fault, of course, but most of them thought it was, and consequently there was a large proportion of points "Not in use" among this class.

The record case of obstinacy that occurred in this connection was as follows:—A strong-minded person of the type "that has never been done yet" informed the local Council—an assemblage of the low-moralled—in the course of an acrimonious correspondence on the subject of wiring rent, that the electrical fitments were always considered part of the fabric—a natural fungus that grew in houses, I suppose he thought. He refused absolutely to have the installation in his house, and gave the Council two days to get it out. At the end of two days, the Council having acted with its usual expedition, he threw it out himself, in the road, and had the house wired at his own expense. He became a "private-wired" consumer and the only known case of a consumer getting the better of an electrical undertaking.

There is a sequel, however.

The imbroglio previously referred to occurred shortly afterwards, and the strong-minded one intervened (armed) and left his house empty and placarded "To be Sold" by a house agent. While it was awaiting the arrival of a new owner the Council's nameplate was fixed to his installation, and by this simple process it again became a "free-wired" house.

This incident actually occurred within 8,000 miles of where you read this, unless you are on a very high mountain in New Zealand. I hope this clue won't give it away.

The consumer—the man who keeps us all, when you think it out—has, of course, got to pay for his installation somehow, but there must be some more tactful way of making him do it than the free-wiring system; it is far too direct.

Mules, I have found, will only allow themselves to be saddled with a big load if they don't see it. Why should the consumer not only be allowed to see it, but have his nose rubbed into it as well?

For the purpose of the analogy I find I have called the consumer a mule. He is not, of course.

ELECTRO-FARMING.

By R. BORLASE MATTHEWS, M.I.E.E.

[*Abstract of paper read before the* Institution of Electrical Engineers.]

In England and Wales alone there are 418,000 farms and small holdings, of which nearly 10 per cent. have each an area of over 150 acres. About 3¼ per cent. of the total number are of over 300 acres each. Hence, if use were made of electricity to any considerable extent in farming operations there would be an enormous demand both for apparatus and for energy.

For some time past the author has been making careful experimental investigation into the practical possibilities of the use of electricity in agriculture, and in this paper he gives the outcome of the results of his practical experience.

The experimental work has been carried out on the lines of actual working farming with strict regard to profit and loss. Nearly all the author's experiments have been carried out on his own farm of 600 acres at Greater Felcourt, East Grinstead. At the same time he has been making a careful study of Continental methods of attacking the same problem.

The conclusion arrived at by the author is that for the most successful operation of farms the use of electricity will be essential from the points of view both of cutting down the total cost of power and labour and of obtaining an increased output, and the author maintains that an increased efficiency, including the circumvention of adverse weather conditions, is easily obtained by electrical methods. Incidentally, the application of electricity to agriculture will do much eventually to raise the status of the labourer.

For farmers of under 150 acres careful thought must be given to ensure that an adequate return is obtained for the capital expended, as the number of hours of use of each machine is limited. For larger farms, as the hours of use are longer, it is not so easy to make a mistake with regard to the equipment.

A table, compiled by the author, indicates the very wide scope which exists for electricity on a modern farm. All the particulars are collated from actual practice on present-day farms, but naturally all the methods are not to be found on, and further, are not suitable for, any one farm. Incidentally this table will be found of considerable assistance when considering the possibilities of the applications of electricity on any particular farm.

In general, most of the problems associated with electrical drives inside the farm buildings are now solved—except that, as in other industries, many radical changes will have to take place in the design of the actual machines. Incidentally, as so many farm buildings are ill-adapted for the mounting of counter-shafts and the like, there will obviously be an increased demand for self-contained machinery. Further, owing to the lack of skill on the part of the farm labourer, the biggest demand will always be for that type of machinery which is practically self-contained and fool-proof. However, for the next few years, while farmers are conservatively "trying out" electricity, the portable motor will serve most requirements.

On the land much slower progress has been made in applying electrical methods. Only a few days' work each year is required in any one field, and even this short time is occupied with diverse operations. Electrical methods of performing these operations have now passed the experimental stage and are about to be introduced commercially on the sound basis that it will pay the farmer to adopt them.

Although, even under the best conditions, the load factor of an individual arable field is low, the completely electrically equipped farm has a load factor which is quite satisfactory from the central station point of view, especially when any farm is considered in conjunction with neighbouring farms.

A great deal of work that ought to be substituted by electric power is being done by manual labour on farms to-day. However, even progressive farmers are not usually aware that electricity can assist them until an electrical engineer studies the situation and shows them the possibilities. A difficulty arises here in that but few engineers have sufficient knowledge of the intimate details of farming methods to develop electrical methods without considerable study, and sometimes a good deal of investigation, before success is attained.

The general problem might be simplified if the farmer were looked looked at in another light. He is really a manufacturer who, commencing with certain raw materials, puts them into a more refined condition—with possibly a second process if he converts his refined materials into the form of animal flesh. In the course of this procedure all by-products are—or should be—fully utilised. Viewed in this way, it does not take an engineer long to realise that the lines upon which farms are normally worked are based upon an abundance of cheap labour and a disregard for time. On the other hand, the engineer will soon find that there are really serious difficulties in modernising a business in which the load factor of each machine, or possible machine, is so low.

Continental experience shows that the annual consumption of electricity in farm buildings alone is proportional to the size of the whole farm and averages 10 kWh per acre. The consumption in the farm-house would average 1 kWh per 33-watt lamp per annum, or an average of 210 kWh. To this must be added 800 kWh, for heating, cooking and domestic power. If the farm were very modern there would be in addition a consumption of 33 kWh per acre of arable land for ploughing, plus one-third of this for cultivation, electro-culture, electric silage, harvesting, &c., or a total of 44 kWh per acre.

As the outcome of experience, practice in electric power distribution for agricultural purposes is settling down to a simple standard. While the main distribution may be at any pressure over 50,000 volts, in Europe a sub-distribution of 10,000 volts, three-phase, 50 periods, is becoming standard. In America this sub-distribution is at either 13,200 or 6,600 volts, three-phase, 60 periods. The Continental standard final pressure for farm supply is 380 volts for three-phase motors, and for lighting 220 volts single-phase (obtained between any phase and a neutral conductor). The electric distribution lines in such a case consist of four wires, the fourth or neutral wire also acting as a guard. At road crossings tall iron-lattice standards are employed, of such a height that if a wire gives way at either support it will not come into contact with ordinary traffic. In addition, each wire as it leaves a standard to cross the road is strengthened by one or two stays attached to insulators. This would seem to be a much simpler and more effective method than the use of cradles.

The number and size of transformers are reduced to a minimum. For farm work a useful minimum size is a 50-kVA transformer. From this transformer supply distribution lines can be conveniently run in any direction for a distance not exceeding 2,500 yards (say, 2 km). In Denmark overhead lines of 25 mm² (0.039 sq. in.) are usually employed for farm supply: where the load is 50 kVA, or more, a section of 35 mm² (0.054 sq. in.) is employed. To allow for the pressure-drop, the motors which are installed at the ends of the lines are wound for a voltage from 10 to 15 per cent. lower than normal. It is rarely that the bigger motors are operated in the evening, when the lights are mainly in use.

Unquestionably the best and cheapest method by which the farmer can obtain power is from a public distribution network, but where this does not exist he must install a properly-designed independent plant—for electricity is now indispensable on the farm.

The author has devised an arrangement whereby the farmer's oil tractor can be made to give effective service until a permanent plant is available. A special reinforced concrete runway, having strong side guiding kerbs always aligns the tractor in the same position facing the dynamo, which is driven by belt from the tractor pulley. Belt-tightener rails, provided with an adjusting screw operated by a crank handle, enable the belt to be very quickly adjusted as the tractor is taken away or brought in.

Power rates, based on the horse-power of the motors connected, discourage a farmer from installing a number of motors—in fact, in America, in certain districts where such rates exist, farmers are installing oil engines to reduce the number of their electric motors. After all it is the maximum demand that affects a public supply, and maximum-demand meters, with a suitable time-lag, are reasonably cheap. With the aid of suitable technical advice it can be demonstrated to farmers that they can obtain better terms on a self-restricted maximum demand. Agricultural-implement manufacturers are already catering for this requirement by providing such machines as threshers, in such a form that the work is carried out in two separate stages. In one machine the corn is threshed and cleaned sufficiently for the farmer's own needs. In the second machine that portion of the corn from the thresher that is intended for the market is finally dressed, cleaned and sorted. Either of these machines can be driven by a 5-h.p. electric motor, as compared with the 12½-h.p. motor required for a standard full-size thresher. The saving in wages for extra men more than compensates for the extra time taken. In this manner, and by the aid of self-restricted circuits, an average farm will offer a very satisfactory load factor for the central station.

Electrically-operated farm machinery—both the mechanical and electrical portions—should rarely need overhaul. This, in fact, is one reason why machinery is not employed to a greater extent on some farms. A trouble that is often encountered with farm electric motors is damage by moisture, due either to rain or to condensation. Ball-bearing electric motors are to be preferred for farm use, if provided with good felt packings, as frequent lubrication is eliminated. Undoubtedly the most practical motor for farm use is the three-phase squirrel-cage type. For farms of over 300 acres the author favours three-phase power installations on this account, coupled with the fact that as soon as a public power supply is available the

farmer who already has a private installation will not have to change his motors.

At first thought the load factor of a farm does not appear to be very attractive. However, if electricity is available, experience shows that it will soon be employed for a variety of other purposes, if only the attention of the farmer is drawn to its possibilities. A very important use, where water is not already laid on, is for driving the water pump for general farm purposes and also for domestic use. Still another service which may be reckoned among the essentials is the driving of a liquid-manure pump. If a dairy herd of more than 10 cows is kept, it is advisable to employ a motor-driven cream separator and also a milking machine. For driving the milking machines from 2 to 3 h.p. is required. Milking machines have proved a very valuable asset to the farmer and, where run under the direct supervision of the farmer or his son, are highly successful; and any complaints that arise as to the ineffective operation of these machines will nearly always be found to be due to the fact that they are in the charge of cowmen who do not take any interest in their operation. Over 9,000 farms in New Zealand employ milking machines. The milking load comes on very early in the morning and again in the afternoon. The preparation of food for the live stock is usually carried out in the morning. If a threshing machine and also a hay and straw transporter and elevator are added to the above equipment there will be a fairly heavy load for 12 hours each day during the winter. In addition electric lighting will be needed in the early morning hours and again at night. At the hay- and corn-harvest periods the driving of the barn machinery would be replaced by the operation of an electric fan for curing the hay and sheaves of corn, also for elevating hay and silage crops; in addition a chaffing machine would have to be driven for cutting silage. If a number of sheep were kept an electric shearing machine should be employed; in fact, once electric power is available, its use will extend in many directions. Among the uses on the land that should be seriously considered nowadays are electric ploughing and cultivation, electro-culture of growing crops, and electric treatment of silage. On a small farm of under 150 acres the barn machinery required can usually be driven by a 1-h.p. motor. On a farm of 150 to 300 acres a 5-h.p. electric motor is most suitable. On farms of over 300 acres at least 15-h.p. motors are required. A very good estimate can be formed of the power necessary to drive a machine by substituting a ½ to 2-h.p. motor for a man or two men, or replacing a horse or two horses by one 5-h.p. motor.

A table prepared by the author shows that for individual drives the size of motor required on farms varies from 1/30 to 150 h.p. An air-pressure system of supplying water is the most efficacious, the size of motor required being from ½ to 3 h.p.

With a view to the elimination of counter-shaft drives and also to enable each piece of barn machinery to be placed in the position where it is most convenient for it to do its work, portable electric motors are having a considerable vogue. Their use certainly reduces the number of motors necessary on a farm and also the capital invested. However, it is a moot point whether in the course of the year's use the value of the time lost in adjusting and fixing them would not pay the interest and depreciation on a direct-connected motor. Considerable difficulty is often experienced with the installation of a suitable counter-shaft drive, and portable motors have one great point in their favour, *i.e.*, they enable new drives to be tried and experimented upon in cases of doubt. For work outside the farm buildings they are often invaluable, and are a most useful addition even when the main drives are fixed. The motors should preferably be of the drip-proof type, a more economical form than the totally enclosed type, and yet possessing a good deal of protection. If the motor is of the ordinary open type it should be provided with a dust-protecting cover. Continental practice favours very substantial, three-point suspension horse-drawn enclosed vans for motors of 15 to 40 h.p. For smaller motors the author advocates a wooden platform, suitable for use with a transporter, as employed under modern factory conditions, so that the lifting truck can be pushed underneath it when it is required to move the motor to another place.

(To be concluded.)

Discussion in London.

Mr. Ll. B. Atkinson said that the two main disadvantages from the point of view of the application of electricity to agriculture were the very small financial return per acre to the farmer, and the very small amount of time in any given year that any machinery could work. Taking the period of seven years before 1914, and working in the ordinary way, it had been shown that the return per acre was about £5 15s., and taking a 150 acre farm the average return from produce would be from £750 to £1,000. From the figures given in evidence before the Agricultural Commission in 1919 the total cost per acre was £4 19s. 3d., leaving a margin of about 15s. per acre, so that a man farming 150 acres would have a net return from his produce of £112 per annum, and that was such an amount that the farmer would look very carefully into any scheme for the use of electricity to see where he was going to benefit, and it certainly did not leave him in a position to spend large capital sums in the use of electricity. The author had said that the maximum load, leaving out the larger works, on a 150-acre farm, would be 3-kW of maximum demand for 1,500 hours a year for farm buildings, which was about 1½ hours use of the maximum load per day, or 4½ kW-hours per day. Then came the cost at which this would be supplied or at which it would be used, and we must not forget that for these smaller powers there was a serious competitor in the small petrol or paraffin engines which were very largely used, not only in this country, but all over the world. An electricity supply company might look to a revenue of £16 per annum from such a farm, if the supply was given at 2.6d. per unit, which it would have to be in order to compete. Thus the supply company could not afford a capital expenditure of more than £73 in order to give a supply to a 150-acre farm. If the supply was given at 4d. per unit—a figure mentioned in the paper, and one which he thought many farmers would be pleased to pay—the supply company could afford a capital expenditure of £150, and the revenue would then be between £30 and £40 instead of £16. Greater savings would be made by increased production, and that was why he would like to stress the question of electro-culture. The reports of the Committee appointed by the Board of Agriculture, mentioned in the paper, showed an increase of about 30 per cent. by electro-culture in the case of spring-sown corn crops, both of the grain and the straw; and going back to the 150-acre farm, an increase of 30 per cent. would add something like £1 16s. to the 15s. which was the present net return.

Mr. Bernard Jenkin said he wished to speak more from the farmer's point of view, although he had only had seven years' experience of farming a 300-acre farm. He had made certain calculations of the amount of haulage done by horses on his farm, and had arrived at a figure of 4,000 miles loaded and 1,000 miles empty, and it was interesting to inquire how far electricity could be used for replacing that horse haulage. It seemed to him that electricity was unsuited to a very large extent. He did not think that electricity could compete with the tractor for ploughing, because the load was entirely a haulage load, including hauling on the road, which electricity could not do. Electric lighting in farm buildings was extremely desirable, and it was eminently suitabe for driving small machines, but the small oil engine would do it every bit as well. In many respects electricity was eminently unsuited because the power could not be got where it was wanted, and they could not have cables lying about the fields. Much the same remarks were to be made as regarded sewage pumping. In the electrification of crops the difficulty would be with regard to the supports for carrying the wires, and he could not [illegible] feeling that there was a far bigger margin for increased profit in the difference between good and bad farming by ordinary methods than was available by the use of electricity.

Mr. F. Ayton, managing director of Messrs. Ransomes, Sims & Jefferies, Ltd., of Ipswich, said he was glad to be by the side of his old chief (Mr. Jenkin) again, who had taken up agriculture whilst he (Mr. Ayton) was interested in the manufacture of agricultural implements. He disagreed with some of the author's remarks as to the lack of skill shown in the design of ploughs, and assured him that a considerable amount of care and consideration was given to this matter. The conditions in this country at the present time were that there was no demand for electric ploughing, and there was no inducement for manufacturers to make such plant. As soon as there was a demand the plant would instantly be forthcoming.

Mr. J. F. Newman said he was specially interested in electro-culture. He had worked a 600 acre farm for the past 14 years, and used three tractors and six horses, and he calculated that the work done would necessitate 30,000 units per annum or 60 units per acre per annum. It seemed to him that the competition of petrol must always be a formidable factor in farming, and Mr. Ferranti, in an address to the Institution some years ago, said something to the same effect, that the convenience and portability of the petrol engine would make it a strong rival of the electric motor. Mr. Newman referred to Prof. Lemstrom's experiments in the use of high-pressure electricity for stimulating growing crops. Lemstrom first started with wires 10 in. off the ground, and he raised them as the crops grew. The poles were 13 ft. apart, but it was found essential to have fewer poles and wires high up out of the way of farming operations. At Evesham the speaker had experimented with poles at varying distances apart, and the final experiments were with poles 110 yds. one way and 168 yds. the other, which was one for every four acres, but that was found to be too far apart for the safety of the network. In 1906 he secured the co-operation of Sir Oliver Lodge and the late Mr. R. Bomford, and a series of experiments was started in 1906: these had been carried on until the present time. Electricity was said to be a stimulant to the crops, but a stimulant should not be taken too often nor too regularly, and it occurred to him as possible that in some of the experiments the crop had been over-stimulated. In one experiment of his a very much stronger current was given, and during the first three weeks of the crop a distinct advantage was to be observed, but after that it died away, and at the harvest the electrified crop yielded about the same as the unelectrified crop. He thought that more time should be given to the small-scale experiments—pot-culture work—which was more completely under control.

The discussion was then adjourned until April 6th.

THE DAYSOHMS "UTILITY" ARC WELDER.

A New Field for Electric Welding.

Although we have already described the Daysohms low-pressure a.c. arc welder (Electrical Review, May 13th, 1921, p. 631), we think it will be of interest to our readers to give a description of the latest pattern of this machine, which has been designed to supply a very large, but hitherto much neglected market; this market is found among the medium-sized and small iron-working shops, down to the motor-car repairing shop employing only two or three men, and using, say, not more than six or seven kilowatts for light and power.

Most published accounts of work done by electric arc welding have usually described large and impressive undertakings, such as ship's bulkheads, constructional ironwork for large buildings, &c., with the result that the small man is not aware of the vast amount of profitable work that lies to his hand, and, possibly owing to the consequent lack of demand, his wants in the matter of a simple outfit which may be installed upon such a small circuit as is indicated above have not been adequately catered for.

The Daysohms Utility welder is designed to work on the ordinary a.c. supply circuits, and takes a maximum of 5 kVA from the mains; it can, therefore, be installed on any lighting circuit. Its current range on the secondary circuit is from 20 to 80 amperes at an open-circuit pressure of 55 volts, which is sufficient for any normal make of electrode on the market when this machine is used, and it can handle work from 19-gauge sheet-iron to ¼ in. thick, though larger work can be done, as will be described later.

The outfit consists of a step-down transformer of 5 kVA capacity and a Daysohms automatic choker, the essential features of which are that a much lower choke is in circuit when the arc is struck than when it is running; also the amount of choke in circuit when striking the arc may be adjusted, quite irrespective of the amount in circuit with the arc when welding, both these adjustments being continuous and not in steps.

This is of the highest importance when welding thin material, such as No. 19-gauge steel plate. If a fixed choke is used to regulate the current, owing to the rapidly falling volt-ampere characteristic produced by it across the arc space, it is practically impossible to get an arc on striking with so little as 55 volts on open circuit. If the open-circuit pressure is raised to the usual amount for a.c. welding, viz., 100 to 110 volts, the sudden rush of current on striking, in the case of thin material, pierces a hole through the work, whereupon, however small the hole, the electrode, having an edge to work on, starts cutting, *i.e.*, a slot is cut instead of a seam being welded.

The general construction of the machine is the same as we have already described, with the difference that all the Daysohms automatic chokes are now fitted with an arm moving over a scale, and provided with a hand-screw for locking it in position (see figs. 1 and 2). This arrangement enables a better adjustment of the welding current to be made, and the scale enables the operator to return to any known position.

The standard machine is designed to work at an open-circuit pressure of 55 volts and a current range of 50 to 150 amperes.

The dashpot, in all the machines, has now been modified by giving it a conical bore, thus lessening its action as the current is reduced; this again greatly improves the machine for welding thin material.

In the case of the 19-gauge sheet it is very noticeable that there is no buckling, as there would be with gas welding; the current taken for this is 30 amperes at 55 volts, equal to 1.65 kVA, and this means an actual consumption of appreciably less than 1 kW, a result which, we believe, has not been hitherto achieved.

This utility welder is particularly suitable for anyone who is starting arc welding in his works. Should the practice of welding grow, as is probable, and a second machine be installed, the two machines can always be coupled in parallel if more current, up to 160 amperes, is required for any special work; or, of course, the larger "Standard" machines may be installed.

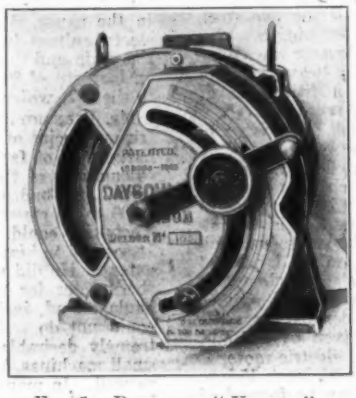


Fig. 1.—Daysohms "Utility" Arc Welder.

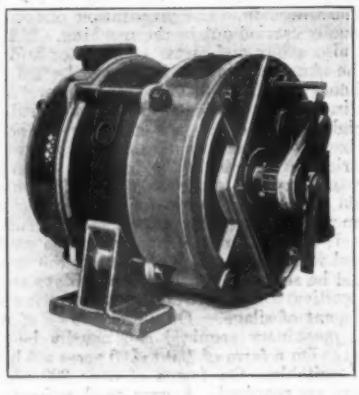
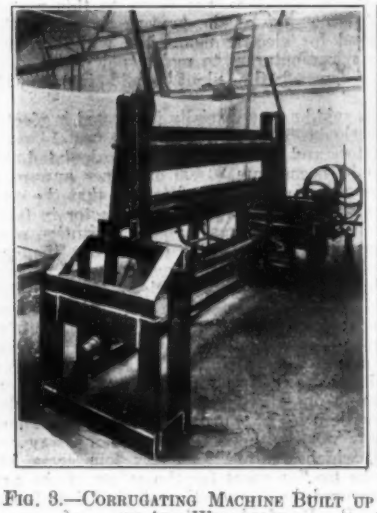
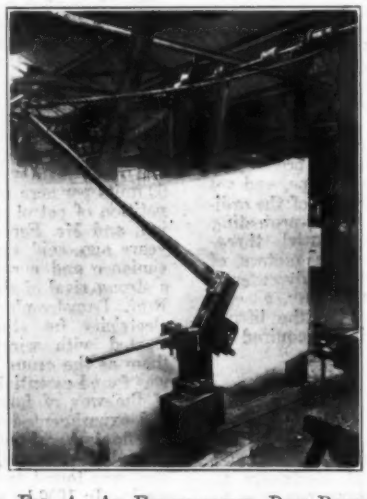


Fig. 2.—Mechanism of Welder.





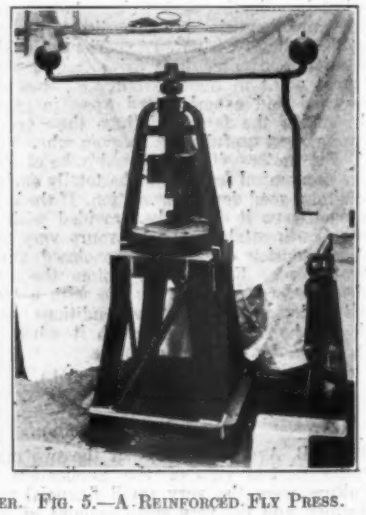


Fig. 3.—Corrugating Machine Built up by Arc Welding. Fig. 4.—An Extemporised Pipe Bender. Fig. 5.—A Reinforced Fly Press.

Several automatic chokes can be supplied from one step-down transformer of a suitable size, thus saving cost, especially when they are not all likely to be working at the same time at full load, and the capacity of the transformer can be less than the sum of the welding circuits.

As Messrs. Davies and Soames, managing engineers to Daysohms, Ltd., have pointed out to us, such a welder installed in a small but growing iron-working shop would probably pay for itself very soon by enabling much of the odd gear and fitments required about the shop to be expeditiously and cheaply made on the spot. In substantiation of this we give a few

examples of such jobs, with their cost in labour and materials, executed by the Foster Engineering Co., Ltd., of Wimbledon, for their own use, in their own factory.

Fig. 3 shows a machine for corrugating up to 6 ft. No. 18 gauge steel sheets for welded transformer cases; with the exception of the bearings, which are standard plummer blocks, bolted on to the framework; the whole machine is welded up of strip and angle iron, the gear wheels being taken from a dismantled crab. The labour and materials on this machine came to £36, whereas to buy such a machine would have cost, at the time it was made, about £300, the saving on this one job being sufficient to pay for the welder more than twice over.

Fig. 4 shows a pipe bender used for bending the oil circulating pipes of transformers, with which many hundreds of feet of pipe have been bent; this machine is almost entirely made up of scrap. A tube is clamped between the jaws on the left and passes out between two cast-iron rollers having semi-circular grooved edges, the long handle being in a horizontal position; a rope fixed to the end of the handle passes once round fast and loose pulleys on the shafting, and when bending the operator pushes the rope on to the fast pulley and then puts sufficient pull on the rope to enable the shafting to draw the handle steadily into a vertical position, when the right angle bend is made perfectly smoothly. The cost of this machine in labour and materials came to £2 15s.

Another job done at Messrs. Foster's, but not illustrated, was a sheet holder for a 6-ft. metal shears. The price of this, tendered by the makers of the shears, was £90. The cost of making and welding it on the spot came to £15. Again, a trolley used for carrying loads up to 6½ tons, running on a narrow-gauge workshop track, was welded up from stock plate, strip, and scrap. The total cost of this was: labour, £4; material, £5; total, £9.

Fig. 6.—Pulley Enlarged by Welding.

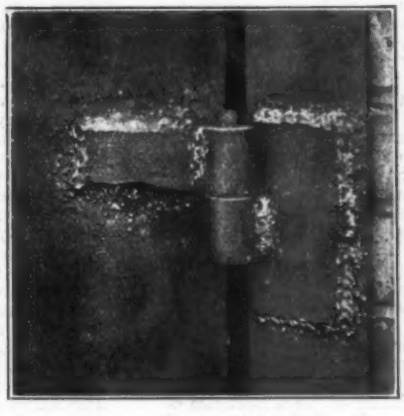


Fig. 7.—Detail of Hinge.

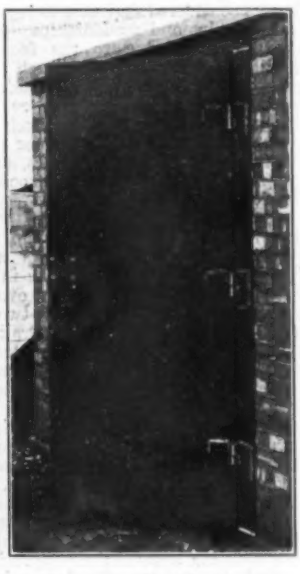


Fig. 8.—A Welded Door.

Fig. 5 shows a fly press which has been strengthened, and the whole stand (from which the bolts have been removed) welded up and stiffened with angle-iron diagonals to take the torque.

Fig. 6 is an illustration of a pulley which has been increased in diameter from 12 in. to 17 in., of which there are a number of examples in Messrs. Foster's works. The cost of this job was: labour, 1s. 10d.; material, 2s. 10d.; total, 4s. 8d. for labour and material.

The cast-iron 12-in. pulley was the standard one on a power hack saw, but ran the machine too fast; it was built up to 17 in. as follows: a disk of 3/16-in. steel was roughly cut and a central hole bored large enough to take the hub of the pulley; this was clamped on the pulley by two hooks round the spokes, with nuts on the other side. Four angle pieces were welded on the face of the disk, pressing on the rim of the pulley to ensure centralisation. The edge of the disk was then turned up by mounting the pulley on a mandrel.

Round the outer edge of the disk was welded a strip of 3/16-in. steel, previously rolled round in rollers and welded up; round the centre of this outer face was welded a 1 in. x ¼ in. strip of steel, to give a "crown" effect and prevent the belt running off.

Fig. 8 shows the 6-ft. 6-in. iron door of a transformer house welded in position. The frame consists of angle iron welded up and fitted inside with angle plates fitting round the end of the bricks. Fig. 7 gives a close-up view of one of the hinges.

In all the illustrations the welds have been chalked to throw them up; in practice they are quite unobtrusive.

It will be seen from what we have said that the "Utility" welder opens up a new and wide field of operations. It may be compared with a soldering bit, in that it enables sheet metal, angle-iron, &c., to be built up into every conceivable combination—but with the difference that for the weakness of solder is substituted the strength of iron or steel. There is immense scope for such work, not only in general jobbing workshops, garages, &c., but also in the repair shops of railways, tramways, and motor omnibus undertakings, in contractors' yards, &c., and in the manufacture in quantity of a variety of hollow-ware and other ironmongery.

THE BRITISH ELECTRICAL AND ALLIED MANUFACTURERS' ASSOCIATION (INC.).

The Council's Report.

The report of the Council for the year 1921, to which we made brief reference last week, mentions that neither the roll of membership nor the record of work exhibits any serious indication of a diminution of energy, although the Association has just passed through a period which afforded little encouragement to the co-operative idea and many discouragements both in number and variety.

It appears to have been reserved for 1921—the third year after the termination of the greatest war known to history—to exhibit the real effect of war upon industry. As an association of manufacturers, they had seen, during 1921, that world business was still to be done; but it was first necessary that the relation of the world's money to the British sovereign should become stabilised. This was not yet the case, and the operations of world commerce were correspondingly hampered. As an association of manufacturers, living by their energies for which there had been so little outlet, and attempting to contribute to the stream of the national life by their export trade, their steadiness and patience under adverse conditions and the highest taxation of any country in the world, were sufficient proof that they had the qualities necessary for taking the fullest advantage of the opportunities of restoring British prestige in the world's markets, which at no distant date must inevitably return. A significant indication of the state of world finance had been the sudden move during 1921 on the part of almost all countries towards revision of tariff. Other grounds for revision apart, countries must of course provide revenue for running themselves; and on the principle of the less trade done, the more must be paid for doing it, almost all countries, and particularly our own Dominions, had been active in this direction. With the assistance of its overseas committees, the Association had to pass under review during the year the tariffs of New Zealand, Canada, India, Spain, and South Africa. In the case of New Zealand, they had been successful in securing the admission duty free, of British electrical apparatus; and in the case of India, a reduction of from 11½ per cent. to 2½ per cent., *ad valorem*, of the duty on high-pressure switchboards, oil switches, motor starters, controllers, regulators, rheostats, and transformers. Representations, originating with the Australian Committee, that "value" according to the current rate of exchange should be the value on which import duties were made chargeable, were accepted, and this was now the practice throughout all the Dominions, a matter of some importance having regard to the appreciated exchanges of two countries doing large business with the Dominions. An Imperial conference of Dominion Customs authorities which sat during the spring recommended the general adoption of a standard form of declaration, but the Dominions had not yet found it practicable to adopt it. The Export Committee had agreed upon a standard full text of conditions for non-erection work. The report refers briefly to the new technical cable code, by the use of which the cost of cabling messages connected with tenders and contracts would be very greatly reduced, only single code words being required where with existing codes extended phrases would be necessary. The Council has recommended the various sections to give careful attention to the provisions of the Safeguarding of Industries Act with a view to taking advantage of them.

The B.E.A.M.A. relations with the Board of Trade are such that any exporting member desirous of availing himself of

the facilities under the Overseas Trade (Credits and Insurance) Amendment Act, 1921, is sure of obtaining the best confidential advice and assistance from the Association. The Association has such relations with the Trade Facilities Act Advisory Committee as will enable it to keep in touch with operations regarding guarantees of capital. The Local Authorities (Financial Provisions) Act confers on municipalities larger powers of borrowing and dealing with their finances, especially with regard to suspending their sinking fund payments in respect of revenue-producing works.

With regard to the Conference of Joint Industrial Councils, which is described as one of the most important of the industrial organisations established in this country, the report says that this sprang into life during the year under the aegis of Mr. Ll. B. Atkinson, who happily seized the moment for its formation when the industry appeared to be most divided as to the representations which should be made to the Government on the subject of unemployment. The new organisation combines for common action, in addition to the B.E.A.M.A. and other associations the Joint Industrial Councils of the cable makers, the electricity supply industry, and the contractors. Thus " the industry " as a whole, *i.e.*, including both employer and employed, can speak to government departments with a single voice. The Conference does not deal with questions of wages or other labour matters ordinarily dealt with by employers' organisations and trade unions.

It was considered desirable to revise the Association's scheme of scholarships and studentships (particulars of which were issued last year), due to the fact that the Department of Scientific and Industrial Research announced scholarships and grants-in-aid which covered practically the same ground as the Association's scheme. Candidates for such research scholarships were therefore put into touch with the Department, and the funds previously intended for research scholarships were, with the consent of the grantors, allocated to scholarships devoted entirely to educational purposes.

The question of admitting overseas students into the works of members, as trade conditions permit, was carefully investigated during the year, and a publication setting out the facilities existing in members' works and the educational possibilities offered in this country is in course of preparation. A census made early in the year, of overseas students in members' works, showed a total of ninety-two students from the following countries: Argentine, Australia, Burma, China, Chile, Egypt, India, Japan, Malay States, New Zealand, Norway, Russia, South Africa, Spain, Tasmania; the countries sending the greatest numbers being Australia, Egypt, India, and South Africa.

The Electrical Research Association was last reported as an incorporated body, so that 1921 was its first complete year of work, during which it entirely cleared the ground and built foundations for the superstructure. At the end of the Association's financial year eleven sections divided into thirty-nine committees had been formed, retaining the services of one hundred and fifty experts in the various branches of research. Those assisting showed their appreciation of the importance of the work by regular attendances in spite of the pressure of other duties and the trying conditions under which ordinary business was carried on; and it is clear that the establishment of a central body able to secure the help and win the confidence of all interested parties, from the premier departments of State to the smallest manufacturing firm, is gradually winning its way to success. The Association's own committee has been correspondingly reorganised and enlarged, so as directly to represent the interests of the sections of the Association.

The interest of members in standardisation work has been very well maintained during the year. This is an encouraging sign. Nothing is better calculated to consolidate the position of the British electrical industry in foreign markets than the adoption by those markets of British standards.

With the return to normal conditions, a stricter interpretation was given by the Home Office to the regulations as to the installation and use of electricity in mines. Upon the issue of H.M. Electrical Inspector's Memorandum embodying his interpretation, several conferences took place between the Association, the Inspector, and the Mining Engineers' Association. As a result, certain general conclusions were reached, and published in the technical Press, as to safeguarding surface switchboards. Committees of the Association are now drafting specifications for underground machinery and apparatus, which may, in due time, result in new B.E.S.A. specifications for mining motors, switchgear, mining plugs for coal cutters, and other portable apparatus; but before that can happen, there will arise many important questions affecting both manufacturer and mine manager, as, for example, with regard to guarantees that apparatus will be and remain safe when used in highly explosive atmospheres, as suggested in certain parts of the memorandum. These matters are now under consideration.

The revision of the specification, *Electrical Machinery*, published in 1917 by the E.S.C. (now the B.E.S.A.) was taken in hand during the year, and was one of the subjects of discussion at the I.E.C. Paris meeting. It is proposed to divide the work into several sections covering, respectively, industrial motors and generators, large machines (including turbo-alternators), rotary converters, and transformers. Drafts of the specifications were completed by the dynamo and motor and rotary converter sections, which will form bases for discussion in B.E.S.A. panels; and the transformer section, by its Technical Committee, is engaged on the preparation of a draft for transformers. A B.E.S.A. panel on traction motors has also been set up upon which the Association is represented. Technical committees of other sections have, during the year, been active in joint work.

The Ministry of Transport and the railway companies had in hand, during the year, the entire revision of *General Railway Classification of Goods* (a volume of nearly 300 pages and about 50,000 important business facts), and the B.E.A.M.A. Traffic Committee had to concentrate practically its whole attention upon those proceedings.

So numerous were the objections presented that a co-ordinating committee was formed, with headquarters at the F.B.I., on which this Association, through its Traffic Committee, represented and co-ordinated the electrical interests, and assisted in co-ordinating other allied groups. The Rates Advisory Committee found it expedient to recognise this committee and to suspend its sittings for a time to permit of its conferring with a committee of the railway companies. These conferences continued until the end of January and resulted in reducing very materially the number of objections, securing agreement on many points, and breaking down in great measure the feeling of antagonism between the traders and the railway companies. The Rates Advisory Committee has now resumed its sittings to settle those cases on which agreement was not reached.

Notwithstanding a reduction in the wages of railway workers, equivalent to about £20,000,000 per annum, and a material reduction in the cost of railway plant and materials, no reduction has been made in the rates for general merchandise which stand at approximately 112 per cent. above pre-war rates. The attitude of the railway companies has been that they are entitled to make a certain profit regardless of the state of trade and the lack of profits in other industries. They argued that a reduction in rates would not bring about such an increase in traffic as would recompense them. In short, the sound old policy of " small profits and quick returns " has been abandoned by the railways for the policy of making profits regardless of turnover.

The report refers to the Railways Act, 1921; to the opposition that traders will continue to offer to the road traffic proposals of the railway companies; and to claims for damage, &c., and the question of demurrage.

The Revising Committee carried through, during the year, several important amendments to the text of the I.E.E. *Model Form of General Conditions*. Twenty-four of the forty clauses underwent amendment in committee; and the new text, after ratification by both Councils, came into currency on November 1st. The Revising Committee has since presented to the I.E.E. a new text, based on the " Model " text (above named), purporting to cover *export* work, so as to provide for cases where the customer abroad specifies " I.E.E. Conditions so far as they may apply," since they do not apply primarily to export. An I.E.E. special committee of revision is now considering the text with a view to recommending the Council to sanction it.

The Association's short set entitled Conditions of Sale " A." covering sales without erection, has earned an excellent reputation. A proposal was recently made for the adoption by the industry generally of that text, suitably amended, as a non-erection set, and the text is now in discussion between the I.E.E. and the Association with a view to joint adoption.

With regard to the sets of conditions issued by Government departments and considered to be inequitable, the Federation of British Industries opened the matter with the Government departments concerned, and the Association is co-operating with the Federation to bring about a satisfactory result.

The report mentions with regret that only about one-fifth of the members directly support the *Beama* journal by advertising in its pages, and the Council hopes for a large accession of advertising supporters so that, with decreasing cost of production, the journal may become self-supporting in 1922.

The progress of the British Electrical Development Association is reviewed. Many problems of electricity supply, which are internally related to the interests of the manufacturer, were dealt with during 1921, notably those arising on housing colonies, housing schemes, tariffs, charges for supply; the relaxation of restrictions upon new construction works; and the promotion of the science of salesmanship. The Council recommends members to acquaint the secretary of the E.D.A. with any new devices and developments in their branch of industry, so that the public may be kept alive to the best and latest practice. The Council, believing in the value of the Industrial Publicity Service, Ltd., to members, has increased its holding in the company. Preparations are now completed for giving a separate establishment to the propaganda side of the activities of that company, and Industrial Intelligence, Ltd., has been registered as a company limited by guarantee. The B.E.A.M.A., the F.B.I., the British Engineers' Association, the Cable Makers' Association, and the Electric Lamp Manufacturers' Association are the first members, and other associations and persons or companies are to be invited to join. It is not intended to be a trading company, but will carry out the distribution throughout the world of news matter of British industrial and commercial interest which, on a smaller scale, has been conducted by I.P.S. since 1918. The main source of funds for the purpose is the profit derived from the advertising agency work of I.P.S.

The Council has under consideration proposals for participating in the British Empire Exhibition, 1924, and full infor-

mation will be communicated to members when advantageous arrangements are made. The partial suspension of the Standing Rule as to exhibitions which expired on December 31st, 1921, has been extended to December 31st, 1922. Members therefore continue to be free until that date to close contracts for exhibiting at any exhibition not wholly or mainly electrical. "The educational effect of the Rule would seem to be evidenced by the fact that for the last three or four years the great majority of members have studiously refrained from accepting invitations to exhibit at many exhibitions held during that period."

After referring to the excellent relations which continue to subsist between the Association and kindred bodies, the report states that the membership on the register at the end of the year was 200.

CORRESPONDENCE.

Letters received by us **after 5 p.m. on Tuesday** *cannot appear until the following week. Correspondents should forward their communications at the earliest possible moment. No letter can be published unless we have the writer's name and address in our possession.*

The Uninsulated Return.

I supply several customers with current (continuous) through accumulators. The system is double wire, insulated, in casing. A customer has had his house wired with "Stannos," using the outer copper casing as return. Some of this is carried along an outside wall exposed to the weather. Is this to be recommended where the other customers have two insulated wires? There is a considerable leakage. The district is usually damp in winter.

Wm. S. Freeman.

Otford.
March 29th, 1922.

The Cost of Living in India.

With reference to the inquiry of Mr. T. Jager, on the cost of living in India at Rs. 1,000 a month, it may interest those concerned to know that I lived in the Punjab Presidency in Lahore on a salary of Rs. 125 a month. I was then connected with the Bengal Punjab Railway in 1906 to 1908. Myself and a friend of mine named Davies lived together and kept up good appearances and always had a good balance after spending freely on luxuries. I should like those days to come again. I would gladly jump at the chance at the present time on Rs. 1,000 and live like a Rajah.

S. H. Cundall.

Sedbergh.
April 3rd, 1922.

What's in a Name?

A glance down the staff-roll of a large factory could be expected to reveal occasional curiosities of nomenclature, but the writer opines that for a place employing 550 persons all told, the remarkable interest of names given here is unique, all, exactly as written, being on the roll of a Manchester power station. Amongst names with a literary flavour, we find Shakespeare, Swinbourne, Scott and Spencer. Psychic science is represented by Lodge, Stead and Doyle, and with special reference to the latter we have Sherlock Holmes and Law. All grades, too, are represented, Prince, Peers and Plowman, Abbott, Baron and Harper.

We have Brewers, Clarkes, Coopers, Cookes, Fryers, Potters, Taylors and Turners, and all kinds, Brown, Grey and White.

We have Flowers, Budd and Twigg; also, alas, Fogg.

Each has its antithesis; Sweetman is contrasted with Lemon and Seville. We have Grace and Vice.

We have Saxon, Norman and Welsh. We have Lyons and two Lambs, to say nothing of Elkes, Eales, Owles and several Foxes and Parrotts.

There is a prosperous touch about John Bradbury and Coyne, and the reverse about Owen, Fall and Farrow.

Memories of the countryside in summertime come with Akers, Horsfield, Appleyard, Flowers, Budd, Twigg, and the notes of Martins, Owles and Partridge in the Wood, and the same country in the winter-time with John Peel, Hunt and Hunter, Fox, Kerr, Spurr and Warren.

Childhood days are recalled by Kite, Pye, and Bratt.

In politics we have a Mazzini, Snowden, Macdonald, and Law, while Lord Birkenhead's honoured cogomen of Smith appears in wholesale quantities.

The stage is represented most excellently by J. Forbes Robertson in Drama, and by Hicks in Comedy.

Lexicography is represented by Johnson and Nuttall, and Music by Sims Reeves and Chant, accompanied by a number of Bells.

War is suggested by Vickers and Gunn, and Architecture from Chappells and Halls down to the humble Hutt.

It may be an advantage to be called Kean, or awkward to be called Slack. And perhaps Knott.

William Tranter.

Stuart Street Electricity Works,
Manchester.

Iron-Nickel Accumulators.

It occurs to us that "R. P. F.," whose letter regarding iron-nickel accumulators you printed in the Electrical Review of March 24th, would be interested to know that the following yachts have been equipped with iron-nickel-alkaline accumulators, and to the best of our knowledge their owners are very well pleased with the results:—

Name of Yacht.	Tonnage.	Equipment.
Fantome I.	170 tons	50 V 300 Ah
Fantome II.	548 tons	2 batteries 100 V 300 Ah
Shemara	477 tons	50 V 225 Ah
Sheila	80 tons	25 V 150 Ah
Jeanette	921 tons	50 V 300 Ah

We shall be pleased to supply any further information you may desire.

Edison Accumulators, Ltd.

London, W.1.
March 31st, 1922.

Commercial Electrolytic Iron.

I have noticed in "Notes" of your issue of the 24th inst. a reference to plant for the production of commercial electrolytic iron.

It may interest your readers to know that the process originated in this country and that a licence was granted to the firm referred to.

Sherard Cowper-Coles.

Sunbury-on-Thames.
March 28th, 1922.

ELECTRICAL MACHINERY AT THE GLASGOW EXHIBITION.

Visitors to the Bakers', Grocers', Confectioners' and Allied Trades Exhibition, opened last week in the Kelvin Hall, Glasgow, showed much interest in the up-to-date electrical machinery for use in these trades, which could be seen in operation.

Morton (Wishaw), Ltd., showed a composite cake plant, consisting of a Morton duplex mixer and Morton whisk, with electric drive, as well as a new model reversing brake for power and a new model electrically-heated pie machine. The "Gem" Labour-saving Device Co. (Manchester) showed the "Gem" electric vacuum cleaner, complete with all accessories. The stand of John H. Spence & Son, Glasgow, was of considerable interest to butchers and allied trades, the "Alexander" machines being on show. The General Utility Co., Ltd., Glasgow, had a comprehensive display of machines and plant for the catering trade, including electric motors, while Bramigk & Co., London, showed machinery and accessories for the chocolate and confectionery trade. Hobart Manufacturing Co., Ltd., London, displayed direct-driven machinery, including electric dough-mixers, electric cake-mixers and whisks, electric coffee mills and roasters, and electric dish-washers for hotels. W. M. Still & Sons, Ltd., Hatton Garden, showed the J. & S. boiling water apparatus for tea making, &c., electrically heated. Messrs. Thos. Melvin and Sons, Ltd., Glasgow, had a fine show of various bakery machinery, including "triple action" and "Simplex" types of dough kneaders and 3-speed and 4-speed combination cake machines and egg whisks. Rose Bros. (Gainsborough), Ltd., exhibited wrapping machines. G. Davidson Gibson, Glasgow, showed "Grafton" automatic bacon slicing machines, hand and electrically driven, and "delta" potato peeling machines for hand and power drive. Jos. Baker, Sons & Perkins, Ltd., London and Peterborough, displayed a patent "Ovamixa" three-speed whisk with a direct geared motor. The Prierty Mason Machine Co., Ltd., Stockport; Thomas Collins & Co., bakery engineers, Bristol; C. Portway & Son, Halstead, Essex; and Jackson Boilers, Ltd., Leeds, all had attractive displays. James Cruickshank, Edinburgh, exhibited the "Lothian" bread moulder and the "Giant" 4-speed cake machine driven by electric motor and Petter oil engine; while Belhaven, Ltd., Wishaw, displayed bakery and confectionery plant, and Messrs. Reads & Bakers' Machinery, Ltd., London, showed the Read 3-speed mixers in operation.

NEW ELECTRICAL DEVICES, FITTINGS, AND PLANT.

Readers are invited to submit particulars of new or improved devices and apparatus, which will be published if considered of sufficient interest.

"Genii Neptune" Hot-water Radiators.

MESSRS. GEORGE NOBBS, LTD., 89, Cleveland Street, Fitzroy Square, W.1, have introduced a new "unit" system of heating by means of hot-water radiators. The "Genii Neptune" units are strongly constructed of cast-iron, and are of neat appearance (see fig. 1). They are made in two sizes, with

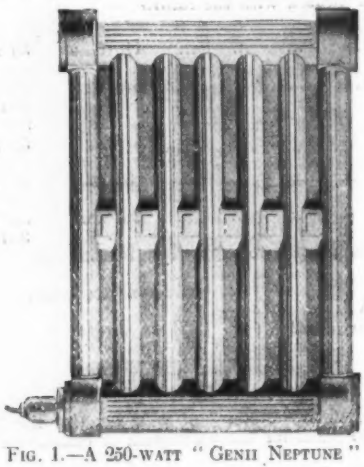


FIG. 1.—A 250-WATT "GENII NEPTUNE" UNIT.

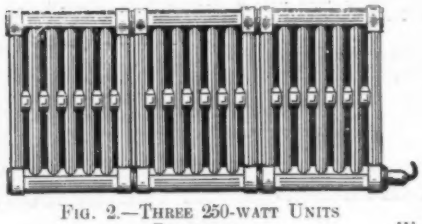


FIG. 2.—THREE 250-WATT UNITS COMBINED.

FIG. 3.—WALL-MOUNTING.

immersion heaters of 250- or 500-watt loading. The radiators are made for wall mounting, and can be built up by arranging them either side-by-side (as shown in fig. 2) or back-to-back. The heating elements are enclosed in heavy tinned-copper sheaths terminating in flanged gunmetal bosses with terminal caps, and securely fitted to the boss of the radiator. The units shown in fig. 2 are of the 250-watt size; fig. 3 shows the method of mounting on a wall.

Thermic-Magnetic Flashers.

What is claimed to be an entirely new form of flasher for actuating electric signs has been designed by the SCIENTIFIC ELECTRIC CO., of the Platt, Putney, S.W.15, for continuous working on currents of from 0.3 to 10 amperes, at pressures of from 100 to 240 volts. Its chief characteristics are the employment of a magnet in conjunction with thermostatic metal, which combination is said to result in a large and quick make and break being obtained. All parts are robustly made, the contacts being constructed of tungsten and pro-

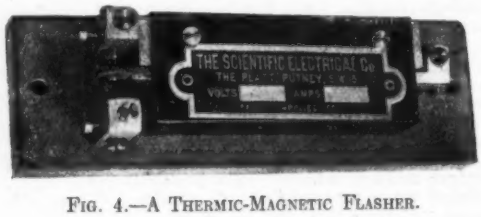


FIG. 4.—A THERMIC-MAGNETIC FLASHER.

vided with finely-threaded adjusting screws. The maximum temperature that the device can reach is below 60 deg. C., so that the possibility of its burning out can be ignored. Two sizes are made, either for one- or two-way duty; the smaller size is illustrated in fig. 4, its dimensions being 5 x 1.5 x 1.5 in. Should the device fail to function owing to worn contacts it is only necessary to screw in the contact screw until it begins to operate again. This can be done as often as required until the contacts have been completely consumed. The time of flash can also be varied by means of the contact screw. Inquiries should be addressed to Mr. G. C. McKenzie, 15, Newton Road, Cricklewood, N.W.2.

A Cable-bonding Nipple.

THE WALKER ELECTRICAL SERVICE, 11, Clyde Street, Edinburgh, has introduced a small brass bonding nipple for use in wiring systems in which 3/.029 twin cables are employed. This consists of a flanged brass bush threaded internally and externally, and a hexagon nut. As will be seen from the

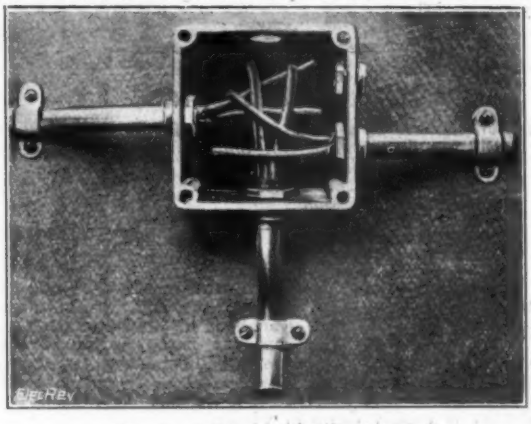


FIG. 5.—A CABLE BONDING NIPPLE.

illustration (fig. 5), the bush is screwed on to the lead of the cable and projects into the connector box, the flange resting on the outside. The hexagon nut is then screwed on and tightened against the interior of the box.

The "Deylite" Fitting.

Fig. 6 illustrates the "Deylite" fitting manufactured by MESSRS. J. & W. B. SMITH, LTD., 15-23, Farringdon Road, E.C.1. This is made in one piece, consisting of a top reflector

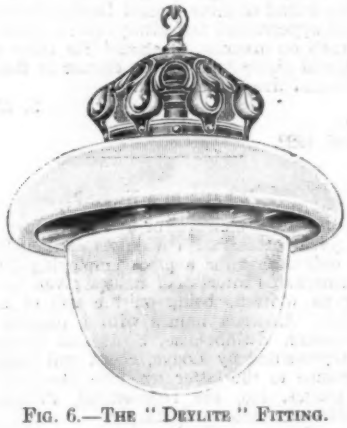


FIG. 6.—THE "DEYLITE" FITTING.

and a bottom bowl of opal glass, between which is a clear flint glass panel. The fitting gives a soft, shadowless light, and is dustproof.

New Switch- and Fuse-gear.

From MR. GEORGE TURNOCK, 41, High Street, Aston, Birmingham, we have received samples of switch- and fuse-gear embodying some new features, which he has designed. The "Pennington" double-pole switch and fuses are contained in a "cast-iron box" 1 ft. high, 6 in. wide, and about 8 in. in depth overall. The switch portion is mounted on a strong quick-make-and-break device and the operating handle is interlocked with the hinged cover, preventing opening while the switch is on. The switch blades consist of brass bars, upon each end of which is fitted a laminated copper contact piece. These contacts are made in two V-shaped parts with a V-shaped space between them, and they fit into and over corresponding terminals fixed in a porcelain-shrouded base. The fuse-bases are of porcelain mounted on teak blocks. On these bases are mounted copper spring contacts and brass terminal blocks, providing for the side entry of small copper connecting rods from the fuse-bases. These terminals are entirely enclosed by porcelain covers, in the top of which are two slots for the receipt of the contact blades of the fuse bridge. The latter has a solid top and

the blades are sunk into the under-side as is also an asbestos tube carrying the fuse wire. An asbestos-slate shield is placed between the two poles, and the box is lined with asbestos-paper. A small cut-out, also sent to us, is made in four parts. The base is similar to the fuse-base described above, and this is also enclosed by a porcelain cover. The fuse bridge is in two parts. The bridge proper is a porcelain block, into which copper blades with specially-designed flat heads slide. The fuse wire is twisted round two projections, which form a part of these heads, and underneath the heads, covering the top of the bridge, is an asbestos pad. A steel stirrup with a grub screw in the top is swivelled in the bridge, so that it can be brought up and over the fourth part —an ordinary porcelain block which clamps the fuse-blade heads in position—being itself held by the stirrup and grub-screw. By this means it is claimed that the entry of air is prevented and any flame caused by the blowing of the fuse is immediately damped.

The "Onoroff" Lampholder.

Mr. J. A. Brook, of 84, Blackmoorfoot Road, Crosland Moor, Huddersfield, has sent us a sample of his new "Onoroff" lampholder, which, as its name implies, enables a lamp to remain in it and to be in or out of circuit. The holder is of a standard type, but the slot into which the lamp pins slide is extended on both sides of the entry, so that if the lamp is inserted and turned to the right, as usual, the lamp is illuminated. If it is turned to the left it is fixed in the holder but remains "off." It is claimed that this device is a cheap and effective substitute for key-switch holders where there are several lamps on one circuit. The cost is the same as that of an ordinary lampholder.

SINGLE AND THREE-PHASE COMMUTATOR MOTORS.

Discussion at Leeds.

At a well-attended meeting of the North-Midland Centre of the Institution of Electrical Engineers, Dr. S. P. Smith read his paper on the above subject (which was abstracted in our issue of January 13th) on January 17th, when Mr. W. E. Burnand occupied the chair.

A number of slides were exhibited and explained by the lecturer, who pointed out that the illustrations showed what could be done with the motors.

Mr. Creedy, who opened the discussion, contented himself by exhibiting two slides, which showed something of the practical side of one type of motor.

Mr. Woodhouse hoped that Prof. Smith's faith was justified. He (Mr. Woodhouse) had had a certain amount of experience with that type of motor in the past, first of all with the single-phase motor with the series characteristic in which the speed was regulated by shifting the brushes, which behaved perfectly. Worsted spinning was carried on on cop frames, and the tension of the thread depended on the particular diameter of the turn on the bobbin on which the yarn was worked. If they could vary the speed of their spindles in proportion to the diameter of the bobbins they could keep the tension of the yarn constant, pack the yarn tighter, get a bigger weight on the cop, and also a bigger output from the frame. The disadvantage was that the motor had a series characteristic, and the average speed depended to some extent on the temperature of the spinning room. Unfortunately, to get the best result the line pressure had to be kept absolutely constant. It was finally abandoned as not being quite suitable. Had they been able to get a single-phase commutator motor with a shunt characteristic he thought the results might have been better. Undoubtedly for that sort of purpose there was a big field for a variable-speed a.c. motor. With larger motors for fan driving the only disadvantage was that of the first cost. Mr. Woodhouse had had experience also of other types of variable-speed a.c. motors which had not been satisfactory.

Mr. Brown (Bradford) said that Mr. Creedy could offer a machine which, to a certain point, had great advantages, but which failed in a good many places when compared with the shunt-controlled d.c. motor. What was wanted was a machine which would give anything up to a 6 to 1 speed ratio with an infinite number of gradations. The size of the motor which was really wanted in the textile industry would not be anything more than about 100 h.p.—probably 20, 30, 40, 50 h.p. would be more common sizes. From a practical view-point the method of control was all important. Candidly, he did not want a commutator. With regard to the method of altering the brush feed in order to produce the different speeds, in each case the variation was made by a wheel or handle on the motor itself. When they got down to practical politics they would have to develop a means of controlling the speed of the motor from a distance, so that the operator could do it himself without the danger of blowing himself up or damaging the motor. In most drawing offices, when a man set out to design a motor-drive he looked for the most awkward corner he could find, and that was the place for the motor. Then the draughtsman devised all kinds of fancy drives in order to reach the machine where the power was to be absorbed. It was in those cases where the difficulty of controlling the commutator might arise, and it was a point which would do with a good deal of consideration.

Mr. Atkinson observed that the way Dr. Smith had put the subject before them had revealed the matter to him in quite a different light.

Mr. F. B. Adkins, A.M. (Doncaster), pointed out that the paper stated that "no flux embraces the short-circuited coils when the brushes are in the neutral position." That was contrary to his (Mr. Adkin's) experience. When the brushes were in a neutral position the machine sparked worst, as in a repulsion motor. His difficulty was to build small repulsion motors with more than six poles owing to the power factor, starting torque, and overload capacity being so very poor. He should like to know if they were to understand that it was possible to build small single-phase motors for 50 cycles to start as repulsion motors, and change to shunt motors on reaching synchronous speed without any centrifugal device or moving parts, so that they would still be capable of speed variation by voltage control in such manner that the h.p. output was proportionate?

The Chairman, in bringing the discussion to a close, said that, personally, he liked the machines, but he could not sell them. The use of the inter-pole for utilising the current short-circuited by the brushes was a great invention. It was really that which had made the machine practicable in large sizes.

Dr. S. P. Smith, in replying to the discussion, said some British firms ought to be saved from themselves. Britain was a nation which largely lived by export trade, and that export trade, to a great extent, was engineering. Let them look at the position they were in with regard to traction work. If they took the thing they knew most about, d.c. traction, they might think that quite a number of British lines were electrified, and that they were getting on pretty well in that way, but to speak as a designer or manufacturer one did not feel quite so happy. If they counted all the electrified lines in this country and the names of the firms by which the apparatus or equipment was designed and built they would get an unpleasant surprise; far too little equipment had been designed and built in this country. There were one or two notable exceptions, fortunately, but, generally speaking, most of their electrified railways had been equipped with foreign equipment. The orders might have been given to British firms, but he was talking about where the apparatus came from. In some cases it was built in this country, but not designed in the country. One hoped that in the future the exception would become the rule. They had spoken about it as if they were great authorities on the matter, and actually they had been factors. As to alternating-current traction, those who had studied the problem had already come to see that they would not get any one basic system at all. Single-phase motors were being used in Switzerland, Italy, and—to some extent—in Germany, Sweden, Norway, and Austria on a very wide scale. Locomotives were being turned out almost every week. Last summer he was in the shops in Switzerland, and he could not see anything else but railway equipment, nearly all single-phase. One hoped that it would not be many years before Russia began to pull together, and like most people who had water-power, Russia would electrify her railways. If Britain went on in the way she had done in the past British firms would not get the orders. The Colonies were only beginning to electrify, and it did not follow that they would finish with the system they had started with. Six to one was about the limit of what one might ask in the way of speed range. Gradual speed control was easily obtained by brush changing, and with regard to high cost the fact that the orders were few made the price high because they could not standardise. With regard to remote control, on some of the 200 or 300-h.p. motors the brushes became too heavy for suitable hand control, and they needed a little motor, but if the motor was very small it became a question whether the control motor might not be rather large compared with the driving motor. Still there was no difficulty in that, and it had often been done. They were making use of a commutator, not because they liked it—they disliked it—but because it gave them the particular characteristics that they wanted to get. He did not think that really one could do without it. It was good to know that Mr. Burnand was one of the pioneers in the design of those machines.

Electrolytic Zinc.—An attempt is shortly to be made to turn to commercial account the dumps, containing 150,000 tons of material, at the inactive zinc and lead mines in North Cardiganshire. The proposal is so to treat the blende ore lying in these dumps by the electrolytic process as to produce zinc. This will be a pioneering experiment so far as this country is concerned, but the electrolytic process has been adopted in British Columbia and Tasmania with marked success, and it is contended that there is no reason why it should not succeed equally in North Cardigan, where the water power resources will probably be utilised in connection with the scheme.—*Birmingham Post.*

NEW PATENTS APPLIED FOR, 1922.

(NOT YET PUBLISHED.)

Compiled expressly for this journal by Messrs. Sefton-Jones, O'Dell and Stephens, Chartered Patent Agents, 285, High Holborn, London, W.C. 1.

7,970. "Alternating-current dynamo electric machines." British Thomson-Houston Co., Ltd. March 18th.
7,984. "Sparking plugs." M. A. Gray and A. D. Paterson. March 18th.
7,987. "Apparatus for controlling railway signals of the electric light type." R. Dell. March 18th.
8,007. "Electrically-operated hooter." R. Bosch Akt. Ges. March 20th. (Germany, October 17th, 1921.)
8,011. "Electrical control gear." F. Addie and A. G. Hartley. March 20th.
8,036. "Electric couplings." E. R. Beckwith, H. T. Hall, and W. H. Slaughter. March 20th.
8,043. "Sparking plugs." A. M. Reigate (P. Saphra). March 20th.
8,056. "Coil ignition systems for internal-combustion engines." N. A. Block, J. W. Coward. March 20th.
8,064. "Remote control switches." L. Calvete. March 20th.
8,066. "Apparatus for conversion of musical sounds or their mechanical equivalents into electricity or *vice versa*." A. F. R. Cotton and E. W. Russell. March 20th.
8,078. "Electrical condensers, and method of making them." Wireless Specialty Apparatus Co. March 20th. (United States, March 30th, 1921.)
8,079. "Brush and brush-holder for commutators." W. J. Randall. March 20th.
8,081. "Train-lighting, &c., dynamos." A. H. Darker and J. Stone and Co., Ltd. March 20th.
8,082. "Dynamo-electric machines, &c." W. B. Sayers. March 20th.
8,111. "Switch for flashing signs." H. Rottenburg. March 20th.
8,115. "Oscillatory circuits." C. J. R. Alsford. March 21st.
8,143. "Intervalve high-frequency transformers." W. R. Burne. March 21st.
8,148. "Sound-producing horns for gramophones, &c., telephone receivers, &c." S. D. Bennett. March 21st.
8,182. "Brush-holder for electric machines." J. Raper. March 21st.
8,187. "Electric soldering irons, &c." C. S. Best and L. O. Meyer. March 21st.
8,188. "Electric heating apparatus." C. S. Best and L. O. Meyer. March 21st.
8,191. "Electric accumulators." P. G. A. H. Voight. March 21st.
8,210. "Electric circuit interrupters." Metropolitan-Vickers Electrical Co., Ltd. March 21st (United States, March 23rd, 1921.)
8,211. Electric insulators." Metropolitan-Vickers Electrical Co., Ltd. (Railway & Industrial Engineering Co.). March 21st.
8,215. "Joints of electric cables, &c." J. H. van Viersen. March 21st. (Holland, November 1st, 1921.)
8,237. "Regulating devices for dynamos." A. J. Jullin. March 21st. (France, March 26th, 1921.)
8,243. "Measuring intensity of cross-talk between lines of a multiple-wire telephone system." Felten & Guilleaume Carlswerk Akt. Ges. March 21st. (Germany, May 26th, 1921.)
8,244. "Apparatus for feeding polyphase mercury-vapour rectifiers." Akt. Ges. Brown, Boveri et Cie. March 21st. (Switzerland, March 24th, 1921.)
8,245. "Magneto-electric ignition apparatus for internal-combustion engines." Scintilla. March 21st. (Switzerland, April 29th, 1921.)
8,247. "Control of electrically-propelled vehicles." British Thomson-Houston Co., Ltd., and H. C. Hastings. March 21st.
8,248. "Electric insulators." M. F. H. Gouverneur. March 21st. (United States, April 7th, 1921.)
8,249. "Electric switches." British Thomson-Houston Co., Ltd. (General Electric Co.). March 21st.
8,262. "Transformer of three-phase currents into monophasic current." A. Verner. March 21st.
8,271. "Telegraph systems." W. J. Cole. March 22nd.
8,303. "Electric welding and heating devices." E. Schröder. March 22nd.
8,305. "Electric switches." H. W. Clothier and A. Reyrolle & Co., Ltd. March 22nd.
8,306. "Electric lamps." A. A. Sandbrook. March 22nd.
8,333. "Telephones." H. M. Macnaughton-Jones. March 22nd.
8,341. "Dials for telephone services." F. McClarence. March 22nd.
8,348. "Protective systems for electric conductors." R. W. Biles and A. Reyrolle & Co., Ltd. March 22nd.
8,352. "Synchronising electric safety lift lock." W. C. Karasek. March 22nd.
8,354. "Automatic electric motor starters." British Thomson-Houston Co., Ltd. (General Electric Co.). March 22nd.
8,368. "Glow-discharge tubes." J. Engl, J. Massolle, and H. Vogt. March 22nd. (Germany, March 24th, 1921.)
8,369. "Electrical driving of compressors." Newton Bros. (Derby), Ltd., and F. Newton. March 22nd.
8,371. "Lock for electric lifts." G. Newbury and H. F. Thomas. March 22nd.
8,372. "Alternating-current rectifying apparatus." H. Andre. March 22nd. (France, March 26th, 1921.)
8,374. "Spark plugs." J. de La Boissiere. March 22nd. (France, March 29th, 1921.)
8,381. "Electric condensers." Dubilier Condenser Co. (1921), Ltd., and W. H. Goodman. March 22nd.
8,419. "Head, &c., lamps for motor vehicles, &c." E. Talbot. March 23rd.
8,421. "Connectors and couplings for electric cables." H. Hawkins and L. R. Lee. March 23rd.
8,425. "Utilising discarded dry-cell batteries." G. H. Stevenson. March 23rd.
8,426. "Continuity clip for electrical slip conduit pipe and fittings." A. Fletcher. March 23rd.
8,455. "Electrical operation of automatic weighing-machines." H. W. Underhill. March 23rd.
8,457. "Electric welding on alternating-current circuits." W. Langdon-Davies and A. Soames. March 23rd.
8,462. "Inductances." A. Onwood. March 23rd
8,463. "Electrical ignition systems for internal-combustion engines." A. Drummond. March 23rd.
8,465. "Electric drives for sound-reproducing machines." British Thomson Houston Co., Ltd. (General Electric Co.). March 23rd.
8,469. "Cathode delivery tube for recording electric frequencies free from inertia." J. Engl, J. Massolle, and H. Vogt. March 23rd. (Germany, March 24th, 1921.)
8,470. "Process for undistorted record of sounds on a support sensitive to light." J. Engl, J. Massolle, and H. Vogt. March 23rd. (Germany, March 24th, 1921.)
8,471. "Electric arc welding." British Thomson-Houston Co., Ltd. (General Electric Co.). March 23rd.
8,494. "Change-speed device for electric drive of underwear looms." F. Portal. March 23rd.
8,502. "Electric switches." L. J. Hooper and C. L. Pratt. March 23rd.
8,504. "Wireless telegraph receiving systems." C. S. Franklin and B. J. Witt. March 23rd.
8,507. "Electric clocks." L. H. M. Huydts. March 23rd.. (Holland, September 30th, 1921.)
8,512. "Collector for electric cranes for collecting current from trolley wires." O. Morgan. March 24th.
8,513. "Collector for electric cranes for collecting current from trolley wires." O. Morgan. March 24th.
8,523. "Electric contacts." H. J. S. Thomas. March 24th.
8,526. "Electric contacts." E. K. Beddington. March 24th.
8,534. "Automatic electric illuminating device for alarm clocks." A. B. Brothwell. March 24th.
8,535. "Telephone transmitter mouthpieces." A. F. Marsh. March 24th.
8,540. "Electric accumulator." A. H. Culley and L. Mott. March 24th.
8,554. "Terminal electric connections." M. L. Williams. March 24th.
8,555. "Commutators or distributors for electric ignition circuits, &c." G. H. Mottershead. March 24th.
8,578. "Protecting device for electric motors, &c." C. J. Rixen. March 24th.
8,583. "Electric circuit interrupters." Metropolitan-Vickers Electrical Co., Ltd. March 24th. (United States, March 24th, 1921.)
8,590. "Electric resistance furnaces." L. J. Hancock and T. R. Hancock. March 24th.
8,591. "Means for preventing oxidation of electric conductors, &c." L. J. Hancock and T. R. Hancock. March 24th.

PUBLISHED SPECIFICATIONS.

The numbers in parentheses are those under which the specifications will be printed and abridged, and all subsequent proceedings will be taken.

1920.

3,606. "Telegraphic and other electrical circuits for use with ionic tubes or valves." W. H. Eccles. November 5th, 1920. (176,390.)
18,929. "Sparking plugs." S. L. Collins. April 6th, 1921. (176,393.)
20,840. "Secret telegraphic, telautographic, telephotographic wire or wireless transmission systems." Soc. Anon. des Télégraphes E. Belin. December 24th, 1914. (153,597.)
25,451. "System for controlling relays by means of wave trains especially for wireless high-speed telegraphy." Siemens & Halske Akt. Ges. September 3rd, 1920. (Addition to 146,594.) (176,401.)
27,181. "Barrel apparatus for the electro-deposition of metals." W. Turton. September 24th, 1920. (176,411.)
27,583. "Alternating current generators." Ges. fur Drahtlose Telegraphie. September 29th, 1919. (151,651.)
27,666. "Process of electrically etching printing reproduction or relief plates for various purposes." W. H. Mellersh Jackson (Weeks Photo Engraving Co.). September 29th, 1920. (176,412.)
28,388. "Electric switches." F. Painter and G. H. Ide. October 7th, 1920. (176,421.)
30,642. "Vibratory devices for subaqueous sound signalling apparatus." Signal Ges. December 15th, 1919. (Addition to 148,972.) (155,489.)
31,576. "Electric lamps for use in mines and for other purposes." Thor Electric Safety Lamp Co., Ltd., and T. Stretton. November 8th, 1920. (176,445.)
33,869. "Tramcars, omnibuses, and like vehicles." J. A. Davenport. December 1st, 1920. (176,466.)
34,126. "Manufacture of carbon." British Thomson-Houston Co., Ltd. (General Electric Co.). December 2nd, 1920. (176,476.)
34,127. "Governing mechanism." British Thomson-Houston Co., Ltd. (General Electric Co.). December 2nd, 1920. (176,477.)
34,238. "Electric heating element." Automatic and Electric Furnaces, Ltd., and J. P. Coleman. December 3rd, 1920. (176,481.)
34,301. "Electro magnetically-operated time lag devices." R. Amberton. December 4th, 1920. (176,483.)
34,447. "Dynamo-electric machinery." H. F. Joel, sen., and H. F. Joel, jun. December 6th, 1920. (176,488.)
34,469. "Generation of continuous waves for wireless telegraphy and telephony by thermionic valves supplied direct from a low frequency polyphase circuit." L. G. Preston, C. L. Fortescue, H. Morris Airey, and G. Shearing. December 6th, 1920. (176,491.)
34,554. "Electric heating or resistance elements or units." J. C. C. Macdonogh. December 7th, 1920. (176,498.)
34,602. "Increasing the efficiency of dynamos or motors." G. H. Tatham and F. P. Bryan. December 7th, 1920. (176,503.)
34,816. "Shades or screens for electric and gas lights." G. Youatt. December 9th, 1920. (176,517.)
35,019. "Electric fuse boards." R. W. Bill. December 13th, 1920. (176,528.)
35,297. "Protective devices for electrical distribution systems and apparatus." British Thomson-Houston Co., Ltd. (General Electric Co.). December 15th, 1920. (176,539.)
35,338. "Duplex telegraphy and telephony." Soc. Francaise Radioélectrique. January 16th, 1920. (157,889.)
35,715. "Electric circuit breakers and the like." R. A. R. Bolton and H. Bacon. December 20th, 1920. (176,547.)
35,976. "Electric driving or winding device especially adapted for clockwork movements and the like." Landis & Gyr Akt. Ges. December 26th, 1919. (155,780.)
36,086. "Apparatus for the conversion of continuous or alternating electric currents into alternating currents of any desired frequency, variable at will." Soc. Anon. pour l'exploitation des Procédés M. Leblanc Vickers. December 23rd, 1919. (155,784.)

1921.

215. "Electric switches." S. F. Woodell. January 4th, 1921. (176,571.)
370. "Enclosed electric fuses." A. L. Eustice. June 21st, 1918. (156,495.)
438. "Operation of electromagnetic clutches." Siemens Schuckertwerke Ges. December 12th, 1913. (156,528.)
670. "Conductors for electric machines consisting of several members connected in parallel." Bergmann Electricitats Werke Akt. Ges. February 20th, 1914. (156,674.)
1,217. "High frequency telephony and telegraphy." Deutsche Telephonwerke Ges. November 15th, 1919. (157,306.)
1,293. "Method of determining distances by means of wireless telegraphy." W. Burstyn. December 15th, 1919. (157,372.)
3,383. "Automatic induction train control systems." A. G. Shaver. November 8th, 1920. (171,348.)
3,534. "Electric head lights for vehicles." R. Bosch Akt. Ges. November 25th, 1920. (171,963.)
3,597. "Motor vehicle electric lamps." H. Lucas and W. H. Egginton. January 29th, 1921. (176,607.)
4,749. "Construction of the field magnets of dynamo-electric machines." J. W. Howard. February 10th, 1921. (176,629.)
6,595. "Electrical furnaces." A. Imbery. February 28th, 1921. (176,658.)
7,728. "Electrical and magnetic polarity and sex indicator." R. D. Young. March 29th, 1921. (176,672.)
9,162. "Method and device for governing a servomotor adapted to regulate working or service conditions of a contrivance." H. Zoelly and A. Gagg. March 24th, 1920. (160,793.)
13,642. "Refrigerator cars for electric trains." Akt. Ges. der Maschinenfabriken Escher Wyss et Cie. May 25th, 1920. (163,702.)
14,231. "Electrical precipitation apparatus." Lodge Fume Co., Ltd., and N. Stallard. May 21st, 1921. (176,713.)
14,319. "Electric motor controllers." Igranic Electric Co., Ltd. (Cutler Hammer Manufacturing Co.). May 23rd, 1921. (176,714.)
31,874. "Electric switches." R. Bosch Akt. Ges. November 29th, 1920. (172,301.)

1922.

5,207. "Electric switches." British Thomson-Houston Co., Ltd. (General Electric Co.). December 3rd, 1920. (Divided application on 176,147.) (176,740.)